

SEK

From: John Christy <climateman60@gmail.com>
Sent: Thursday, August 21, 2025 10:13 AM
To: Ross McKitrick <ross.mckitrick@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>; Steven Koonin <steven.koonin@gmail.com>; Roy Spencer <roywspencer@hotmail.com>
Subject: Re: public comments posted

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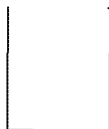
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Draft dear jonathan letter (cc audrey)

Dear Jonathan,

Based on last week's call, we expected you to arrange another call this week. As a reminder, here are the outstanding issues:

- Release all of the public comments on the CWG report (we have spotted 200 that are released)
- Curry does not yet have a contract
- Koonin, Christy and Spencer's SGE appointments have just ended
- We need an update on the lawsuit filed against the DOE and CWG, and whether there are constraints on our public statements
- We would like an update on the status of external review committee for the CWG Report
- We would like clarification on the schedule we need to work under for revising the CWG Report and responding to comments
- We would like an update on the status of the NCA5 Review, and whether the charge for that has changed.

Thank you for your attention to these matters

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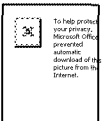
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I'll send that (presumably you mean Jeremy, not Jonathan)

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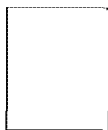
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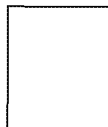
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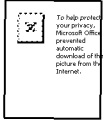
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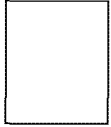
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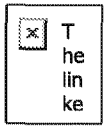


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picture from the
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From: Steven Koonin [steven.koonin@gmail.com]
Sent: 8/21/2025 2:15:30 PM
To: 'John Christy' [climateman60@gmail.com]; 'Ross McKittrick' [ross.mckittrick@gmail.com]
CC: 'Judith Curry' [curry.judith@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]
Subject: RE: public comments posted
Attachments: ~WRD0002.jpg

I'd hope the DOE staff will do the collating, grouping, ... and response to the non-specifics. They should also flagging the groups of substantial comments for us to respond to.

SEK

From: John Christy <climateman60@gmail.com>
Sent: Thursday, August 21, 2025 10:13 AM
To: Ross McKittrick <ross.mckittrick@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>; Steven Koonin <steven.koonin@gmail.com>; Roy Spencer <roywspencer@hotmail.com>
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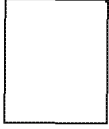
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Sent: Tuesday, August 19, 2025 11:39 AM
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Cc: Steven Koonin; Roy Spencer; John Christy
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From: Roy Spencer <roywspencer@hotmail.com>
Sent: Wednesday, August 6, 2025 11:52 AM
To: Travis Fisher; Steven Koonin
Cc: Ross McKittrick; climateman60@gmail.com; Judith Curry
Subject: Re: a defense of CWG25 in the Italian press

I forwarded it to Anthony.
-Roy

From: Travis Fisher <travis.scott.fisher@gmail.com>
Sent: Wednesday, August 6, 2025 10:11 AM
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Thank you all for welcoming me into the liaison role. It was truly a career highlight!

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Cc: John Christy; Travis Fisher; Ross McKittrick; roywspencer@hotmail.com
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I suggest we wait to see what the comments look like, so far 68 comments (and none are visible yet on federal register). I think it is a good idea to enlist outside experts for specific comments, but we need to see the comments first

On Tue, Aug 5, 2025 at 3:48 PM Steven Koonin <steven.koonin@gmail.com> wrote:
Should we, over the next few weeks, begin to identify and enlist, chapter by chapter, a team of a few realists who can help formulate responses?

People we cite - Soon, Scafetta, ... would form an initial list.

Steven E. Koonin

On Aug 5, 2025, at 18:40, John Christy <climateman60@gmail.com> wrote:

Cliff Mass would be a critic on some of the topics, but a very helpful, honest critic. He's a councillor on the AMS board - he could have suggestions for critical yet helpful reviewers.

John C.

On Tue, Aug 5, 2025 at 5:33 PM Steven Koonin <steven.koonin@gmail.com> wrote:
And if we get a gusher of comments, we might benefit from someone with AI expertise to sort, triage, and summarize criticisms, chapter by chapter. And then, if necessary, identify suitable "realist" experts to help with a response.

Steven E. Koonin

On Aug 5, 2025, at 18:14, Steven Koonin <steven.koonin@gmail.com> wrote:

I think this is a good thing.

In formulating our responses, perhaps we could selectively enlist other climate realists.

Steven E. Koonin

On Aug 5, 2025, at 18:07, John Christy
<climateman60@gmail.com> wrote:

From Cliff Mass - even AP is on the prowl. Why didn't they do this with the IPCC or NCA?

John C.

Hello,

We're Seth Borenstein and Michael Phillis, reporters on the climate and environment team at The Associated Press. As you know last week, the Trump administration's EPA proposed rescinding the 2009 Endangerment Finding on climate change. It did so with two documents. One was the actual EPA proposal and the other was the Department of Energy Climate Working Group's "A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate." We have decided to ask the authors of every science-oriented reference in both documents about this. That's why we are contacting you.

We've included links to both documents. Yes, they are long and we are sorry for that. Below you will see the page or chapter where your work was referenced for an easier guide.

Can you please by August 12, read these documents – or as much of the pertinent parts as you deem – and send us your thoughts and answer a few of the questions below.

We are purely looking at the science parts of these documents and that's what we seek your thoughts on. In the EPA document, most of the overall science is from pages 75 (on the pdf reader at the top) through 85. We've also included EPA decision science highlights, but it may not be too comprehensive. Please tell us if we are missing something. The DOE document is mostly aimed at the science and its organization is fairly straightforward and it has an executive summary at the beginning. We are contacting well more than 100 scientists and experts like yourself to get a broad sense of the documents' scientific accuracy so not everyone who answers will be quoted but if you do answer, and we would be appreciative, you will definitely help guide us to write a story with depth and authority.

You are referenced in: DOE Chapter 8

So now our questions:

What do you think of the overall quality of the DOE and EPA reports?

Did the sections of the report(s) that cited your work accurately and fairly portray it? Please elaborate.

Do the overall conclusions of the documents accurately portray the overall conclusions of your general body of work? Please explain why or why not.

Does the overall work and conclusions of the documents accurately portray the current, mainstream view of climate science? Please feel free to give details and explain what you consider important or not about this.

Was the selection of sources sufficiently current and representative of the best available science?

Do you consider the work and conclusions of the document to be biased in any way, or not? Please explain with examples.

On a scale of 0 to 100 with 100 being the best, how would you rate the EPA report? What about the DOE report?

If you were teaching an undergraduate class and your student delivered the EPA document as an assignment, what grade on the standard A to F scale would you give it? Why?

If you were teaching an undergraduate class and your student delivered the DOE document as an assignment, what grade on the standard A to F scale would you give it? Why?

Any other thoughts?

Thank you for your time and insight.

Sincerely,
Seth and Michael

On Tue, Aug 5, 2025 at 4:37 PM John Christy

<climateman60@gmail.com> wrote:

Thanks Travis

We five have been through some rough times in the past 10-30 years, and to be given the microphone by such a remarkable leader on energy issues is nothing less than a high honor. Without getting trite, this may be the crowning achievement of some of our careers - and it was a long time coming when you've already passed three-score and ten before

getting to this point. Thanks so very much for herding us through the labyrinth. Let's hope we set a template for other issues that need attention - rigorous analysis that is subject to transparent-scrutiny and acknowledged-uncertainties all along the way.

John C.

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Should we, over the next few weeks, begin to identify and enlist, chapter by chapter, a team of a few realists who can help formulate responses?

People we cite - Soon, Scafetta, ... would form an initial list.

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I think this is a good thing.

In formulating our responses, perhaps we could selectively enlist other climate realists.

Steven E. Koonin

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Hello,

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Why I Helped Organize the Department of Energy's Climate Report

Climate policy is too important to be decided without rigorous debate

Walking into the Secretary's office at the Department of Energy (DOE) headquarters in March of this year, I felt uneasy. I had offered to help the team with whatever they might need, and my friend and colleague Alex Fitzsimmons arranged for me to meet with Secretary Wright. Candidly, after a rough tour of duty in 2016-2018, which included leading a high-profile study of the U.S. electric grid, I was reluctant to rejoin the fray.

By the end of the meeting, however, I was on board with the idea of supporting the DOE again (although it felt a bit like the plot of a bad action movie—you know, where the Special Forces just can't let Arnold Schwarzenegger retire). This was a new DOE and new leader with a fiery passion for the truth. We bonded over the clarity and force of the writing of 19th Century French economist Frederic Bastiat, whose last words were twice repeating the phrase "the truth." We talked about being called to public service. I learned the Secretary became friends with the late Rose and Milton Friedman (yes, the Nobel Prize-winning economist) when they all lived in San Francisco.

The trite advice to never meet the people you look up to does not apply to Chris Wright—I only admired him more as I got to know him. Our meeting started at 4:00 pm that day. By 4:30, I was ready to sign up for whatever mission he had in mind. In the weeks since our meeting, I've noticed he has the same effect on others. It's an unteachable gift that few of us have but anyone can recognize. I call it the Chris Wright effect—he puts your sense of self-determination on steroids. And he had a plan that included me.

Calling all truth seekers

We all know there is little room for debate on the issue of climate change. On the political left, questioning the climate crisis has become an Orwellian thoughtcrime. Although the political right may allow more dissent, many on the right think human-induced climate change is a joke. That's what makes climate change a difficult policy arena for people who think independently. For example, I believe human activity is causing observable climate change, but it's not a crisis. Unfortunately, that statement makes partisans on both sides clutch their pearls.

Even though I gripe about both sides of the political aisle, it's really not a fair fight in terms of influence on climate policy. The political right might have a slight edge on popular social media platforms like X or cable outlets like Fox News, but the halls of academia and government are dominated by the left. To professors and bureaucrats, the question seems to be whether complete decarbonization should happen today or tomorrow, not whether it's good policy to

begin with. As a libertarian, I have to admit I find myself identifying more with the political right because of the left's dogmatic control over the climate change debate.

A decade or more ago, the term “denier” was reserved as a spicy pejorative for people who reject basic physics. More recently, anyone who questions the wisdom of aggressive greenhouse gas (GHG) mitigation policies (such as “net zero by 2050”) is subject to the same awful label. As one example, the Center for American Progress labels a member of Congress a “denier” if he or she has “[c]laimed that the science around climate change is not settled... .”

But it's clearly not settled. For those of us who can see that with our own eyes, we face the choice of rejecting what we know to be true or wearing the “denier” label. And because we cannot reject what we know to be true, we are reluctantly left with the latter. Further, when the “denier” label applies to half the country, it begins to lose its sting.

Enter the experts

The Secretary's plan was simple. We would reorient the debate about climate science and climate policy by confronting the gatekeepers head-on. The DOE was to publish a report that would reinforce areas of wide agreement among climate scientists, such as the observable fact that carbon dioxide is a GHG that is warming the planet (all else equal). However, in the immortal words of Al Gore, it would also shed light on some *inconvenient truths* that cut against the prevailing narrative that climate change is an existential threat.

Among those truths: U.S. historical data do not support claims of increased frequency or intensity of hurricanes, tornadoes, floods, and droughts.

My job was to coordinate the effort without injecting my own bias. Secretary Wright rattled off the names of the top scientists he wanted to lead the effort, all of which hold PhDs and have published on climate science for decades: John Christy, Judith Curry, Steven Koonin, Ross McKittrick, and Roy Spencer (bios here). This group of five authors would come to be known as the DOE's Climate Working Group (CWG).

As the Secretary would later write in the foreword of the 150-page report: “I didn't select these authors because we always agree—far from it. In fact, they may not always agree with each other. But I chose them for their rigor, honesty, and willingness to elevate the debate. I exerted no control over their conclusions.”

Here's a thought experiment: what if we took a group of top scientists we know to be tenacious truth-seekers and gave them the microphone for a moment after being shouted down for years? What would they say?

I witnessed the CWG authors hit a prolific stride when they were freed from the shackles of climate cancel culture. For anyone who questions whether the CWG could produce a 150-page

report in two months, I understand the disbelief. It seems impossible, yet I witnessed it firsthand—the five authors left behind any egos and produced chapter after chapter of repressed truth. It flowed out of them like catharsis. It was finally ok to write what they know to be true, and they let it rip.

Science requires skeptics

The truth about climate science—let alone climate policy—is far more nuanced than the summaries for policymakers (produced by previous government efforts) would have you believe. Notably, a consensus approach tends to omit the nuance that comes with dissent. Judith Curry, a CWG member, countered the mainstream consensus approach in a quote to the Washington Post: “[A]ny scientist that isn’t skeptical isn’t doing their job... Science is a process, and the ‘mainstream’ attempt to enforce a faux consensus to support political objectives is antithetical to science.” Amen.

We should thank the CWG authors for courageously standing up to the climate gatekeepers. To me, they are as honorable as whistleblowers who witness fraud at the highest ranks and refuse to go along quietly. There is something rotten in the state of climate science. As Kimberly Strassel wrote in the Wall Street Journal: “The country is witnessing the rise—finally—of a scientifically armed and debate-ready climate right.” I would argue that we are now hearing from a vocal climate center.

Finally, Energy Secretary Chris Wright deserves a medal for standing firm when the rest of the world was losing its mind over carbon dioxide. When companies across the globe were coming up with glossy reports detailing how they were minimizing their carbon footprint, Chris Wright was writing a book about how his company was bettering human lives. That’s the kind of leadership we need. Serving as liaison for the CWG report was the least I could do. I look forward to reading everyone’s comments—please submit them here.

Where do we go from here?

The CWG report was cited extensively in the Environmental Protection Agency’s (EPA’s) recent rulemaking, which proposes to rescind the finding that GHGs are pollutants that harm public health and welfare (the “endangerment finding”). There is a long road ahead for the administration’s policy change, including court challenges to EPA’s rulemaking and, no doubt, many challenges in the court of public opinion with respect to climate science and climate policy. For the DOE’s part, there will be a final version of the CWG report that will incorporate public comments.

Regarding the broader impact of reversing the endangerment finding, I will give the last word to Secretary Wright: “Thanks to President Trump’s leadership, America is returning to free and open dialogue around climate and energy policy - driving the focus back to following the data.

[The July 29] announcement is a monumental step toward returning to commonsense policies that expand access to affordable, reliable, secure energy and improve quality of life for all Americans.”

From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Tuesday, August 5, 2025 12:40 PM
To: Travis Fisher
Cc: Steven Koonin; roywspencer@hotmail.com; climateman60@gmail.com; Judith Curry
Subject: Re: a defense of CWG25 in the Italian press

Sorry just seeing this. I'm on the road and unavailable until around 2.

On Tue, Aug 5, 2025 at 12:13 PM Travis Fisher <travis.scott.fisher@gmail.com> wrote:
Yes, look for a Google Meet link in one minute!

On Tue, Aug 5, 2025 at 12:07 PM Steven Koonin <steven.koonin@gmail.com> wrote:

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Sent: Tuesday, August 5, 2025 1:57 AM

To: Steven Koonin <steven.koonin@googlemail.com>; Steven E Koonin <steven.koonin@nyu.edu>;
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Sent: Tuesday, August 5, 2025 11:01 AM
To: Travis Fisher; Steven Koonin
Cc: climateman60@gmail.com; ross.mckitrick@gmail.com; Judith Curry
Subject: Re: a defense of CWG25 in the Italian press

If necessary, I can.
-Roy

From: Travis Fisher <travis.scott.fisher@gmail.com>
Sent: Tuesday, August 5, 2025 9:36 AM
To: Steven Koonin <steven.koonin@gmail.com>
Cc: roywspencer@hotmail.com <roywspencer@hotmail.com>; climateman60@gmail.com <climateman60@gmail.com>; ross.mckitrick@gmail.com <ross.mckitrick@gmail.com>; Judith Curry <curry.judith@gmail.com>
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Sent: Tuesday, August 5, 2025 10:45 AM
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Cc: roywspencer@hotmail.com; climateman60@gmail.com; ross.mckitrick@gmail.com; 'Judith Curry'
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Cc: Steven Koonin; roywspencer@hotmail.com; ross.mckitrick@gmail.com; Judith Curry
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Travis

I'll be here at 12:15 ET

John C.

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Attachments: DOE2.docx; 25.08.05.png; Battaglia translation.docx

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Orbene, lo scorso 31 luglio, a firma di **Maxine Joselow** e **Brad Plumer**, il *New York Times* (Nyt) pubblicava un articolo di refutazione del Rapporto-Doe. Come ora vedremo, tutti gli argomenti avanzati falliscono l'obiettivo di refutazione e, di conseguenza, rafforzano la validità del Rapporto-Doe. Virgoletto le citazioni dalla "refutazione" del Nyt.

1. «Gli argomenti del Doe sono tipici di quelli che respingono il consenso scientifico». Qui abbiamo una duplice fallacia. Innanzitutto, siccome sugli argomenti del Doe v'è un consenso abbastanza vasto (si pensi ai 2000 climatologi, geologi, geofisici, astrofisici affiliati alla Fondazione Clintel), si potrebbe parimenti dire che sono i detrattori del Rapporto-Doe a respingere un consenso scientifico. Inoltre, l'argomento del consenso scientifico è a priori fallace, giacché non è sul consenso che si decide tra due diverse congetture.
2. «Il Rapporto-Doe ha lo scopo di dar sostegno politico all'amministrazione Trump». Questa è una calunnia sconfessata dal fatto che gli Autori del Rapporto-Doe sostengono le proprie convinzioni da decenni, prima ancora che Mr. Trump "nascesse". Inoltre, uno degli Autori – il prof. **Steve Koonin** – era stato vice-ministro nell'amministrazione Obama.
3. «Nel Rapporto si fa una scelta selettiva delle conoscenze». A parte il fatto che il Rapporto-Doe è accompagnato da quasi 300 riferimenti bibliografici, l'accusa è formulata ma non è sostenuta da esempi sulle presunte omissioni e, come vedremo a breve, ove omissioni sono denunciate esse sono omissioni inventate.
4. «Il rapporto-Doe è un attacco alla scienza». Un'altra accusa non sostenuta da esempi: non si capisce dove sarebbe «l'attacco alla scienza». L'articolo del Nyt non chiarisce la propria affermazione. Avrebbero potuto ben scrivere: «Il Rapporto-Doe è pieno di bugie», senza però citarne neanche una.
5. «La grande maggioranza dei climatologi concorda che la CO₂ si sta accumulando in atmosfera, facendola riscaldare e facendo aumentare il rischio di uragani e onde di calore». In realtà anche il Rapporto-Doe concorda che si sta accumulando maggiore CO₂ in atmosfera. Solo che conclude che non si osserva negli ultimi decenni un aumentato rischio di uragani e onde di calore. E qui la parola "osserva" è cruciale, perché attiene ai "fatti" per come sono registrati e non ai timori ipotizzati. In particolare, si sono registrati negli ultimi decenni uragani che per intensità e per numero sono inferiori a quelli registrati nei decenni precedenti; e negli anni 1920-40 si è registrato un indice di ondate di calore molto superiore a quello registrato negli anni 2000-2025.

Insomma, ammesso e non concesso che quel rischio sia aumentato, la verità è che quei temuti eventi non sono aumentati né in numero né in intensità.

6. «Uno degli Autori del Rapporto-Doe ha ammesso che “il rapporto non è perfetto”». Qui il Nyt vuol veicolare il dubbio che gli Autori non siano sicuri di quel che hanno scritto. Ma questo è l'atteggiamento dell'onesto uomo di scienza, aperto ad ogni miglioramento e ad ogni aggiustamento se emergessero nuove evidenze. Al contrario, proprio i sostenitori della narrazione mainstream rifiutano ogni confronto e, come dicono spesso, «il dibattito è chiuso».
7. «Il Rapporto-Doe non nega che la CO₂ riscaldi il pianeta e che tra gli effetti del riscaldamento v'è l'innalzamento del livello dei mari». Qui il Nyt vorrebbe veicolare un'altra “debolezza” del Rapporto-Doe, ove esso dà ragione alla narrazione tenuta per 30 anni. Il fatto è che non c'è alcun dubbio che la CO₂ sia un gas-serra e che senza la CO₂ il pianeta sarebbe più freddo. Quel che il Rapporto-Doe contesta è che la CO₂ antropica che si aggiunge a quella naturalmente presente sia di rilevanza sul clima, e afferma che anzi essa è di gran beneficio per la vegetazione e per la resa dei raccolti. Naturalmente il Rapporto-Doe riconosce che v'è uno scioglimento dei ghiacci: ogni aumento delle temperature globali (qualunque sia l'origine, naturale o antropica) comporta un maggiore scioglimento dei ghiacci e, quindi, un aumento del livello dei mari.
8. «Il Rapporto-Doe non accenna al fatto che il global warming può avere effetti negativi sulle rese di riso, soia e grano». Come nel punto 5 precedente (ove abbiamo confrontato il rischio con la realtà fattuale) anche qui si noti l'affermazione ipotetica che si evince da quel “può”. La realtà fattuale è che se si confrontano i volumi dei raccolti di riso, soia e grano del 1950 e del 2000, questi ultimi sono stati da doppi a tripli rispetto ai primi.
9. «Il Rapporto-Doe è stato messo insieme in due mesi [in realtà tre, ndr], invece quelli che esso contraddice sono stati prodotti in anni, da centinaia di scienziati». La critica è molto debole: gli Autori del Rapporto-Doe sono professionisti esperti del campo e conoscono da decenni le cose che hanno scritto nel Rapporto-Doe.
10. «**Roger Pielke Jr.** è un politologo che nel passato ha criticato i climatologi. Egli è ora un dirigente di un *think-tank* di conservatori». Questo Pielke non è tra gli autori del Rapporto-Doe e non si capisce perché è nominato. Il suo duplice peccato sarebbe l'aver manifestato apprezzamento per il Rapporto-Doe e di essere di posizione politica conservatrice. Chissà, forse il Nyt potrebbe incalzare: **Franco Battaglia** ha apprezzato il Rapporto-Doe, ma la sua opinione non conta perché scrive per *La Verità*.

In conclusione: il tentativo di confutare il Rapporto-Doe è senz'altro un apprezzabile impegno ma, in questo caso, è miseramente fallito: il Rapporto-Doe ne esce rafforzato. È così che funziona il metodo scientifico.

Franco Battaglia

► AMBIENTE E POVERTÀ

Dieci punti per smontare le balle sul clima

Il «Nyt» ha provato a confutare il recente rapporto del dipartimento dell'Energia americano, che ha cancellato decenni di frodole ecologiste. Ma il tentativo è naufragato perché, tra altre bugie e imprecisioni, il contestato documento ne esce addirittura rafforzato

di FRANCO BATTAGLIA



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Ma quale studio pro Trump: uno degli autori era con Obama

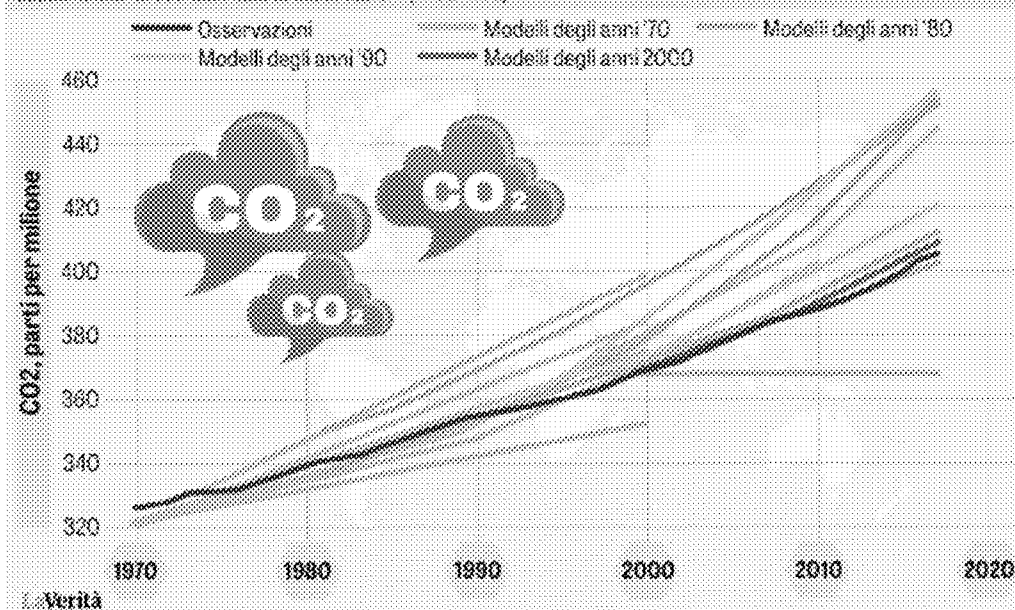
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BANDIMENTO DELLA CO₂-SIME E DATI REALI

Dagli anni Settanta, le successive proiezioni sulle emissioni e sulle concentrazioni (linee colorate) hanno costantemente sopravvalutato le riserve (linea nera)



LaVerità

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4 «Il rapporto-Doe è un attacco alla scienza»: un'altra accusa non sostenuta da esempi. Non si capisce dove sarebbe «l'attacco alla scienza». L'articolo del Nyt non chiarisce la propria afferma-

zione. Avrebbero potuto ben scrivere: «Il Rapporto-Doe è pieno di bugie», senza però citarne neanche una.

5 «La grande maggioranza dei climatologi concorda che la CO₂ si sta accumulando in atmosfera, facendola riscaldare e facendo aumentare il rischio di uragani e onde di calore»: in realtà, anche il Rapporto-Doe concorda che si sta accumulando maggiore CO₂ in atmosfera. Solo conchiude che non si osserva, negli ultimi 50 anni, un aumentato rischio di uragani e onde di calore. E qui la parola «osserva» è cruciale, perché attiene ai «fatti» per come sono registrati e non ai timori ipotizzati. In particolare, si sono registrati negli ultimi decenni uragani che, per intensità e per numero, sono inferiori a quelli registrati nei decenni precedenti; e negli anni 1910-1940 si è registrato un indice di ondate di calore molto superiore a quello registrato negli anni 2000-2025. Insomma, ammesso e non concesso che quel rischio sia aumentato, la verità è che quei temuti eventi non sono aumentati né in numero né in intensità.

SI TERRÀ L'8 SETTEMBRE

Ops Mps-Mediobanca, il Tar fissa l'udienza sul ricorso di Bluebell

È stata fissata all'8 settembre, ultimo giorno dell'offerta pubblica di scambio di Mps su Mediobanca, la discussione del ricorso di Bluebell Partners contro la delibera della Consob che ha autorizzato l'aumento di

capitale del Mps finalizzato all'Ops su Piazzetta Cuccia. La società di consulenza contesta alla Consob di aver accordato a Siena un'informazione semplificata sull'aumento, soprattutto per quanto riguarda i rischi.

Rapporto-Doe riconosce che v'è uno scioglimento dei ghiacci: ogni aumento delle temperature globali (qualunque sia l'origine, naturale o antropica) comporta un maggiore scioglimento dei ghiacci e, quindi, un aumento del livello dei mari.

6 «Il Rapporto-Doe non accenna al fatto che il global warming può avere effetti negativi sulle rese di riso, soia e grano»: come nel punto 5 precedente (ove abbiamo confrontato il rischio con la realtà fattuale), anche qui si noti l'affermazione ipotetica che si evince da quel «può». La realtà fattuale è che se si confrontano i volumi dei raccolti di riso, soia e grano del 1950 e del 2000, questi ultimi sono stati da doppi a tripli rispetto ai primi.

7 «Il Rapporto-Doe è stato messo insieme in due mesi fin

Non nega l'aumento di CO₂ ma solamente numero e intensità di fenomeni estremi

realtà tra, ndr), invece quelli che esso contraddice sono stati prodotti in anni, da centinaia di scienziati: la critica è molto debole, gli autori del Rapporto-Doe sono professionisti esperti del campo e conoscono da decenni le cose che hanno scritto nel Rapporto-Doe.

8 «Roger Pielke Jr. è un politologo che nel passato ha criticato i climatologi. Egli è ora un dirigente di un think-tank di conservatori»: questo Pielke non è tra gli autori del Rapporto-Doe e non si capisce perché è nominato. Il suo duplice peccato sarebbe l'aver manifestato apprezzamento per il Rapporto-Doe e di essere di posizione politica conservatrice. Chissà, forse il Nyt potrebbe incalzare: Franco Battaglia ha apprezzato il Rapporto-Doe, ma la sua opinione non conta perché scrive per LaVerità.

In conclusione, il tentativo di confutare il Rapporto-Doe è senz'altro un apprezzabile impegno ma, in questo caso, è miseramente fallito: il Rapporto-Doe ne esce rafforzato. E così che funziona il metodo scientifico.

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Applying the Scientific Method

In this article, we'll engage in an exercise applying the scientific method. The report from the U.S. Department of Energy (DOE), which wiped out the thirty-year-long environmentalist myth of anthropogenic climate change (a report we covered here on August 3), unsurprisingly triggered various criticisms from those who have upheld that myth for three decades. This is a good thing, because this is how science works—understood as the scientific method (the only meaning I ascribe to the word “science”). That is: I, the scientist, propose a hypothesis, and my colleagues—much to my delight—strive to disprove it. If they succeed, the hypothesis is discarded. If they don't, the hypothesis doesn't become established truth. But the more it withstands attack, the more it earns “supporting evidence” and qualifies as a “scientific theory.”

New York Times Refutation Attempt

On July 31, Maxine Joselow and Brad Plumer published a refutation of the DOE report in *The New York Times*. As we will see, all arguments presented fail to invalidate the DOE report and, in turn, reinforce its credibility. I quote excerpts from the NYT article in quotation marks.

1. *“The DOE's arguments are typical of those who reject the scientific consensus.”*
This is a double fallacy. First, given that DOE's arguments enjoy fairly wide consensus (e.g., among 2000 climatologists, geologists, geophysicists, and astrophysicists affiliated with the Clintel Foundation), one could say the report's critics are rejecting scientific consensus. Second, invoking consensus is itself fallacious; scientific disputes aren't settled by majority opinion.
2. *“The DOE report aims to politically support the Trump administration.”*
This is a slander disproven by the fact that the report's authors have held these views for decades—long before Mr. Trump “was born” (figuratively speaking). Also, one author, Prof. Steve Koonin, served as Deputy Secretary in the Obama administration.
3. *“The report selectively chooses knowledge.”*
The DOE report includes nearly 300 bibliographic references. The accusation is unsupported by examples of alleged omissions—and where omissions are claimed, they are fabricated.
4. *“The DOE report is an attack on science.”*
Another unsupported charge. There's no explanation of where or how this “attack” takes place. They might as well have said, “The DOE report is full of lies”—without citing a single one.

5. *“Most climatologists agree CO₂ is accumulating, warming the atmosphere, and raising the risks of hurricanes and heatwaves.”*

The DOE report agrees that CO₂ levels are rising. It simply concludes that there’s no observed increase in hurricane or heatwave risk in recent decades. The word “observed” is key—it deals with factual data, not hypothetical fears. For example, hurricanes have been fewer and less intense than in prior decades, and heatwaves in the 1920s–40s were more frequent than between 2000–2025. So, even if risks are theoretically higher, actual events haven’t increased.

6. *“One author admitted the report isn’t perfect.”*

NYT uses this to sow doubt about the authors’ confidence. But this is the mark of a sincere scientist: open to revision if new evidence arises. In contrast, mainstream narratives often declare, “the debate is settled.”

7. *“The report doesn’t deny that CO₂ warms the planet and raises sea levels.”*

NYT presents this as a weakness. But it’s undisputed that CO₂ is a greenhouse gas. The report contests the significance of anthropogenic CO₂ compared to natural sources and highlights its benefits for vegetation and crop yields. It also acknowledges that rising temperatures—whatever the source—melt ice and raise sea levels.

8. *“The report doesn’t mention global warming’s possible negative effects on rice, soy, and wheat yields.”*

Note the speculative “possible.” Factually, crop yields in 2000 were double or triple those of 1950.

9. *“The DOE report was put together in two months [actually three], whereas its opposing reports took years and involved hundreds of scientists.”*

A weak critique. The DOE report’s authors are seasoned experts who’ve known these issues for decades.

10. *“Roger Pielke Jr. is a political scientist who has criticized climatologists and now leads a conservative think-tank.”*

Pielke isn’t one of the report’s authors, so his mention is inexplicable. His supposed sins: supporting the report and holding conservative views. By that logic, one might say Franco Battaglia supports the report—yet his opinion “doesn’t count” because he writes for *La Verità*.

Conclusion

The attempt to refute the DOE report is commendable in spirit, but in this case, it fails miserably: the DOE report emerges stronger. That’s how the scientific method works.

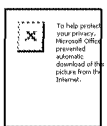
— *Franco Battaglia*

From: Judith Curry <curry.judith@gmail.com>
Sent: Tuesday, August 5, 2025 6:28 PM
To: Ross McKitrick
Cc: Roy W. Spencer; John Christy; Steven Koonin; Josh Loucks
Subject: Re: Internal DoE responses compiled into 1 file

A few minor edits, but fine to just go with your version. Thx

On Tue, Aug 5, 2025 at 1:52 PM Ross McKitrick <ross.mckitrick@gmail.com> wrote:
just as Judy was sending her email I was about to hit send on this one. The attached Word document compiles all the responses into 1 file. It reflects my edits, Steve's edits and John's edits. Judy did you add any other changes?

--



Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
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<http://www.cfanclimate.net>

From: Ross McKittrick [ross.mckittrick@gmail.com]
Sent: 8/5/2025 8:51:52 PM
To: Roy W. Spencer [roywspencer@hotmail.com]; Judith Curry [curry.judith@gmail.com]; John Christy [climateman60@gmail.com]; Steven Koonin [steven.koonin@gmail.com]; Josh Loucks [loucksj14@gmail.com]
Subject: Internal DoE responses compiled into 1 file
Attachments: Internal.DoE.Review.incl.Responses.docx

just as Judy was sending her email I was about to hit send on this one. The attached Word document compiles all the responses into 1 file. It reflects my edits, Steve's edits and John's edits. Judy did you add any other changes?

Pg	Par a	Comment or Suggested Edit	
viii	2	The greening effect can't be due to increase in CO2 alone. The fertilization effect needs Nitrogen and phosphorous. There is observational[1] evidence that nitrogen available to plants is decreasing with increasing CO2 and thus acting to limit fertilization effect. Secondly, the greening of some portions of the planet are likely due to changes in precipitation patterns associated with changing climatic conditions and not entirely attributable to fertilization effect. We will also need to consider that the temperature effect on photosynthesis will also be a limiting mechanism to any continued greening dur to fertilization in the future [2]. I recommend acknowledging that the greening is not attributable to CO2 alone and continued greening in the future with increasing CO2 is uncertain. Changed sentence to “Elevated concentrations of CO₂ directly enhance plant growth, globally contributing to “greening” the planet”	[1] Rachel E. Mason et al. Evidence, causes, and consequences of declining nitrogen availability in terrestrial ecosystems. Science376, eabh3767(2022).DOI:10.1126/science.abh3767 [2] C.E. Moore, et lathe effect of increasing temperature on crop photosynthesis: from enzymes to ecosystems. Exp. Bot., 72 (8) (2021), pp. 2822-2844
viii	3	I am glad we acknowledge that CO2 causes warming, though I am not sure why we are not considering other energy sector related emissions that also cause warming (CFCs/HCFCs, methane, aerosol effects). It is not clear what is meant by "CO2 emissions have tended to overestimate observed trends". This is not correct, the cumulative emissions track the RCP8.5 scenario the closest [3,4]. While there was a decrease in emissions during the Covid-19 period the emissions are now back on track following RCP8.5. This statement should clarify what is meant by the statement in the text. Rewrote sentence in the summary section to read “Climate change simulations require scenarios of distant future emissions. There is evidence that scenarios widely-used in the impacts literature have overstated observed and likely future emission trends.” On page 16 text added “Schwalm et al. (2020) defended the use of RCP8.5 on the grounds that cumulative CO2 emissions over 2005-2020 track it more closely than the lower RCP scenarios. They also argue that a modified version of the IEA scenarios closely track RCP8.5 in the coming decades. Hausfather and Peters (2020b) responded that the skill of RCP8.5 over those 15 years is due to offsetting errors in its representation of CO2 from fuel use and land use change, and the apparent agreement with IEA in coming decades is due to Schwalm et al. adding in very high land use emissions. The IEA’s own projected CO2 emissions track well below RCP8.5.”	[3]C.R. Schwalm, S. Glendon,& P.B. Duffy, RCP8.5 tracks cumulative CO2 emissions, Proc. Natl. Acad. Sci. U.S.A. 117 (33) 19656-19657, https://doi.org/10.1073/pnas.2007117117 (2020). [4] C.R. Schwalm, S. Glendon, & P.B. Duffy, Reply to Hausfather and Peters: RCP8.5 is neither problematic nor misleading, Proc. Natl. Acad. Sci. U.S.A. 117 (45) 27793-27794, https://doi.org/10.1073/pnas.2018008117 (2020).

viii	4	This paragraph seems to be talking about equilibrium climate sensitivity. The most recent model inter-comparison gives a wider range of climate sensitivities in the range of 1.8 to 5.7 and is wider than estimates of climate sensitivities that have been estimated from paleoclimatic and more recent historical datasets, in the range could be in the range of 2.3 to 4.5 K[5]. The higher sensitivity in the most recent model assessments are an area of active investigation by modelers, the feasibility of a higher range needs to be confirmed with additional observational and process scale modeling [6]. The range for climate sensitivities, 1.8-2.7, should be corrected to the most recent findings, 2.3-4.5. We should also recognize that the (a)earth is a complex system of systems (b)we can't do an experiment to find out what is correct or reduced the uncertainty. As we get better at extracting temperature records and CO2 concentrations from paelo data, there will be better reconstructions and possibly narrower range along with improvements in modeling that resolve many physical, biological and chemical processes as we get to higher and cloud resolving spatial resolutions. We discuss Sherwood et al. in Ch 4. Sentence changed: “Data-driven methods yield a lower and narrower range.”	[5] Sherwood, S. C., Webb, M. J., Annan, J. D., Armour, K. C., Forster, P. M., Hargreaves, J. C., et al. (2020). <u>An assessment of Earth's climate sensitivity using multiple lines of evidence</u>. <i>Reviews of Geophysics</i>, 58, e2019RG000678. https://doi.org/10.1029/2019RG000678 [6] Zelinka, M. D., Myers, T. A., McCoy, D. T., Po-Chedley, S., Caldwell, P. M., Ceppi, P., et al. (2020). <u>Causes of higher climate sensitivity in CMIP6 models</u>. <i>Geophysical Research Letters</i>, 47, e2019GL085782. https://doi.org/10.1029/2019GL085782
viii	5	This is again not true for the majority of the models in the AR6. Figure 7.19 in the IPCC AR6 report shows that majority of the models exhibit a range within the observational range. The models running hot in the most recent decades are the ones with climate sensitivities grate than 5K, which are 3 out of a total of 40 and it should be noted that about the same number of models also are running cold' compared to observed[7] Paragraph has been rewritten: The world’s several dozen global climate models offer little guidance on how much the climate responds to elevated CO2, with the average surface warming under a doubling of the CO2 concentration ranging from 1.8°C to 5.7°C [Section 4.2]. Data-driven methods yield a lower and narrower range [Section 4.3]. Global climate models generally run “hot” in their description of the climate of the past few decades– too much warming at the surface and too much amplification of warming in the lower- and mid- troposphere [Sections 5.2-5.4]. The combination of overly sensitive models and implausible extreme scenarios for future emissions yields exaggerated projections of future warming.	[7]Hausfather, Z., Drake, H. F., Abbott, T., & Schmidt, G. A. (2020). <u>Evaluating the performance of past climate model projections</u>. <i>Geophysical Research Letters</i>, 47, e2019GL085378. https://doi.org/10.1029/2019GL085378
viii	5,6,7	There is very little dispute that these are challenging issues for climate science. Many of the issues identified here related to compound effects (subsidence and se-level rise; wildfire and forest management) that requires further scientific investigation. Identifying further research avenues/focus areas will be helpful to firm up some of the challenges faced in using the climate projections as discussed in the paragraph 9. There is no disagreement here.	

viii	9	The focus on uncertainty is relevant and should be emphasized in future research. However, as a reasonable policy pathways, making decisions in the face of these uncertainties is critical. Most of the climate uncertainties that we have confidence at this time can be considered Level 2 and Level 3 uncertainties, approaches such as scenario analysis (and others) are suggested and followed for making hazard and risk estimates for future conditions. For deep uncertainty hazards (for example tornadoes etc.) that we don't have enough data or capability to model, developing methods for assessing the uncertainty and risk should be a focus of future research. There is no disagreement here. See Curry's book Climate Uncertainty and Risk.	
2	3	The reason CO2 was identified as a pollutant is the health consequences of increased temperature, flooding and other climate impacts and not because of any direct affect on health dur to exposure to atmospheric CO2[8]. There is no disagreement here.	[8] https://www.cdc.gov/climate-health/php/effects/index.html
3	1/C hap ter su m ma ry	The summary should note that CO2 fertilization effects are limited by the availability of other critical plant nutrients (Nitrogen, Phosphorous). The fertilization effect is also constrained by higher temperature effecting photosynthesis[9] Added sentence: Other contributing factors included warming and increased nitrogen.	[9] Xinyuan Wei et al 2025 Environ. Res. Lett. 20 064013
3	3	The attribution of greening to primarily CO2 fertilization is questionable as per recent research. Specifically, in the Northern high latitudes (where the greening is most prominent), increases in temperatures due to climate change has been shown to provide the best explanation[10]. In the sub-Saharan region reforestation efforts and changing precipitation patterns lead to some of the observed greening (the great green wall) [11]. The attribution to CO2 fertilization should be qualified by noting the other present and emerging constraints. We cite Zhu et al attributing 70% of change to CO ₂ . That implies other factors matter as well.	[10]Liu, J., Wennberg, P.O. An emergent constraint on the thermal sensitivity of photosynthesis and greenness in the high latitude northern forests. Sci Rep 14, 6189 (2024). https://doi.org/10.1038/s41598-024-56362-1 [11] Francesco S.R. Pausata, Marco Gaetani, Gabriele Missouri, Alexis Berg, Danielle Maia de Souza, Rowan F. Sage, Peter B. deMenocal, The Greening of the Sahara: Past Changes and Future Implications, One Earth, Volume 2, Issue 3, 2020, Pages 235-250, ISSN 2590-3322, https://doi.org/10.1016/j.oneear.2020.03.002 .
3	5	This summarization ignores the compound effects of temperature, moisture and CO2 fertilization in assessing the impacts of CO2 increase on vegetation and crop yields. Many studies have shown that [12]. Making note of these compensating factors is required for a balanced view on CO2 fertilization effects on plants. This issue is addressed in Chapter 9	[12]Lesk, C., Anderson, W., Rigden, A. et al. Compound heat and moisture extreme impacts on global crop yields under climate change. Nat Rev Earth Environ 3, 872–889 (2022). https://doi.org/10.1038/s43017-022-00368-8

4	1	Chen et al. (2024)[13] conclude that "In the attribution analysis of LAI trend and growth rate trend, there were some differences between multiple linear regression model and partial correlation analysis at high latitudes in the northern hemisphere. Partial correlation analysis showed that LAI trend and growth rate trend in this region were mainly affected by temperature and radiation, while multiple linear regression suggested that CO2 was the dominant driver. The results of the partial correlation analysis seem more reasonable because some previous studies have shown that vegetation change in the high latitudes of the northern Hemisphere is mainly positively affected by climate warming. Multiple linear regression model performed relatively poorly in this region and might not fully identify the contribution of individual drivers. In addition, our model does not include the contribution of land management, which has been highlighted in some previous studies. Of course, the contribution of land management to LAI trend and growth rate trend may be implied in other drivers, such as the positive contribution of CO2 to LAI trend in PP and PN areas". We have added the Chen references. Our existing summary doesn't conflict with this. They conclude CO2 is the dominant driver globally but not the only driver.	[13]Xin Chen, Tiexi Chen, Bin He, Shuci Liu, Shengjie Zhou, Tingting Shi, The global greening continues despite increased drought stress since 2000, Global Ecology and Conservation, Volume 49, 2024, e02791,ISSN 2351-9894,
6	1	This again suffers from not acknowledging the effects of compound and often compensating phenomena that is occurring with the on-going climate change. For example [14] note that much of the Midwest any benefit from CO2 fertilization will be negated by temperature increases. [15] note that "Our results show that long-term physiological acclimation dampens the initial stimulation of plant net carbon assimilation to elevated [CO2], and of plant water use to warming." The topic of agricultural productivity is addressed in Chapter 9 It is not disputed that effects of dT go negative at high enough levels. The 2013 paper by Ruiz-Vera et al doesn't provide much general information beyond the FACE experiment site. The C14 data set is a global sample and takes both dT and dC into account.	[14]Ursula M. Ruiz-Vera, Matthew Siebers, Sharon B. Gray, David W. Drag, David M. Rosenthal, Bruce A. Kimball, Donald R. Ort, Carl J. Bernacchi, Global Warming Can Negate the Expected CO2 Stimulation in Photosynthesis and Productivity for Soybean Grown in the Midwestern United States , Plant Physiology, Volume 162, Issue 1, May 2013, Pages 410–423, https://doi.org/10.1104/pp.112.211938 [15] Lamba S, Hall M, Rantfors M, et al. Physiological acclimation dampens initial effects of elevated temperature and atmospheric CO2 concentration in mature boreal Norway spruce. Plant Cell Environ. 2018; 41: 300–313. https://doi.org/10.1111/pce.13079
8	1	The fallacy of these arguments in terms of PH changes and evolution is that the changes described in this paragraph occurred over millennia and the evolutionary process had time to adapt; here with climate change we are talking about changes in our lifetime, the speed of change is the issue. This will lead to collapse of some ecosystem and by the time adaptation takes place it will be millions of years and in a different climate - not the one we have now and that enabled the rise of humans. The chapter notes large regional and even diurnal variations in ocean pH. We already address the issue of short timescale variations on p. 8: "On the time scale of thousands of years, boron isotope proxy measurements show that ocean pH was around 7.4 or 7.5 during the last glaciation (up to about 20,000 years ago) increasing to present-day values as the world warmed during deglaciation (Rae <i>et al.</i>, 2018). Thus, ocean biota appear to be resilient to natural long-term changes in ocean pH since marine organisms were exposed to wide ranges in pH."	
5	Fig 2.2	A simple calculation will show us how misleading this figure is. It shows that over 600 Million years CO2 changed by around 6000ppm. That is a rate of change of 0.00001/yr; COE changed from 275 to 430 in the past 175 years, that is rate of change of 0.88ppm/yr. A change in the rate of over 10^5 in magnitude - there in lies the problem. We are seeing a rapid increase in CO2 that has never been witnessed and the ecosystem and huma society (which is at best 10K years old), may not be able to adapt to this rapid change. This figure has been deleted. We don't know what the rate of changes was on an annual or centennial time scale since the data are too low resolution. We have added the following sentence:	

		“While the modern rate of change in CO2 is likely high compared to prior intervals, the geological evidence is that plants and animals evolved under much higher CO2 levels than at present.”	
12	Summary	The misuse of RCP8.5 as business as usual is acknowledged. However, this was never intended to be a no-policy or business as usual scenario but as a high-end baseline scenario. When dealing with interaction of physical systems with socio-economic projections (which tend to be highly uncertain and policy dependent), the development of this high baseline scenarios is intended to explore the uncertainty ranges that represent a high-end scenario[16,17]. As any engineer would acknowledge, this is a prudent approach when dealing with L3 and L4 type deep uncertainties and provide valid envelopes for assessing uncertainties and risks from high impact events/hazards. The rest of the statements here are uncertainties acknowledged by the climate scientists and included in developing projections and discussing the results[4]. Does the IPCC downplay the role of sun in climate change? The IPCC includes sun variability in all its assessments from the beginning and has been acknowledged as a potential but insignificant contributor. The comments do not imply any disagreement with what we have written. Extreme scenarios for models are useful for bracketing outcomes but our criticism (based on the literature) is the widespread use of RCP as a no-policy baseline; the reviewer acknowledges that was never its purpose. The IPCC’s assessment insignificance of the sun in climate change is based in part on use of low variability irradiance reconstructions that rule out it having any role. This is addressed in Chapter 8	[16]van Vuuren, D.P., Edmonds, J., Kainuma, M. et al. The representative concentration pathways: an overview. Climatic Change 109, 5 (2011). https://doi.org/10.1007/s10584-011-0148-z [17]Hausfather, Z. (2025). An assessment of current policy scenarios over the 21st century and the reduced plausibility of high-emissions pathways. Dialogues on Climate Change, 2(1), 26-32. https://doi.org/10.1177/29768659241304854 (Original work published 2025)
16	2,3,4,5	Please see above. The business-as-usual may be a misnomer but this is an 95% case that is typically included in any type of prudent uncertainty analysis, in particular given the difficulty of predicting the evolution of socio-economic and political conditions over the next 100 years. It should be noted the difference between RCP8.5 and RCP4.5 for mid-century conditions that is of particular focus for adaptation studies in not significant and most of the divergence in these two scenarios occurs later in the century. Implausibility is not equivalent to very unlikely (e.g. 95th percentile), but rather includes impossible or implausible assumptions. High impact hazards occur independent of atmospheric CO2 concentrations (Chapter 6).	

19	5	That the dynamic vegetation models need more development is acknowledged and is a defining challenge for Earth System Modeling for the next decade. There is no disagreement here	
22	3	As noted, Parker[18,19,20] has investigated the Urban effects on temperature records. The finding establish that by comparing warm and wind conditions world wide that the impact is negligible. However, as noted by authors, this literature hasn't progressed much over the last decade and much more attention needs to be paid to this question by employing newer models, datasets and analytical techniques available to us at present. The CWG Report addresses this concern. We agree with the reviewer that the literature stalled a decade+ ago.	[18] Parker, D. Large-scale warming is not urban. Nature 432, 290 (2004). https://doi.org/10.1038/432290a [19]Parker, D.E. (2010), Urban heat island effects on estimates of observed climate change. WIREs Clim Change, 1: 123-133. https://doi.org/10.1002/wcc.21. [20]Parker, D. E., 2006: A Demonstration That Large-Scale Warming Is Not Urban. J. Climate, 19, 2882–2895, https://doi.org/10.1175/JCLI3730.1.
28	2	We can all agree that there is a desperate need for developing higher-resolution climate models that can get to cloud resolving scale so that we can represent the cloud feedbacks correctly in the model and avoid uncertainties from parameterization and scale dependency of the parameters. This doesn't make these models useless. The models provide directions for further improvements and necessary changes to reduce the uncertainty bands over the ECS. The climate models are useful for research purposes. The CWG Report demonstrates that they are not fit for the purpose of policy making. There's no guarantee increased resolution will be the answer, but if ever a model appears that can deal correctly with clouds that will be quite something.	

29	2	The databased approaches have mostly been robust with changes at the high end around 3-4C and at the low end around 1.8 to 2.5C as noted in the chapter. It will be challenging to make this range shorter given the data requirements and uncertainties in data over paleo/haloocene periods. It seems reasonable to estimate that we may have ECS in the range of 3 to 4K (higher than 3.5K being less likely [21]) at the higher end and this should not prevent us from planning and thinking on ways to prevent this possible scenario as it could have major consequences for humans across the planet. The Report acknowledges that 4C is a reasonable upper bound for the likely range	[21] Michael Mann, Our Fragile Moment: How lessons from Earth's past can help us survive climate crisis, Hachette Group Inc., 2024.
32	3	The models range over a factor of three in ECS comparing the most sensitive to the least sensitive models. However vast majority of the models are in 3 to 3.5K sensitivity range and it is probably not correct to assign all models the same amount of importance, given the fact that some of institutes participating in the exercise have different levels of capacity to develop and test models. Only 5 of the models are between 3 and 3.5C Some of the most reputable models have the highest values of ECS, including UK and US models The point made in this paragraph is that research over several decades has not reduced the range of model ECS. For observers who rely on model outputs this is very concerning and again goes to the question of fitness for purpose, as posed in the prior paragraph.	
34	1	While this analysis for the CMIP6 model set is accurate and focuses on a dataset that has shown higher ECS than previous iterations. it should be noted the models have exhibited considerable skill in predicting the subsequent GMST warming[22]. The criticism of the CMIP6 based high ECS models may be premature and probably will have to wait additional time before passing judgement. As noted in [22] these models have shown considerable skill when evaluated on their projections over the past 30-40 years after the projections were published. Figure 5.3 in the Report clearly refutes this assertion Hausfather et al. did examine early model-obs matches but only using models that had relatively low ECS. The Scaffeta analysis covered a longer interval (1980-2021) than the Hausfather et al. analysis of SAR (1995-2017) and TAR (2001-2017). Its findings line up with Fig 5.3 and the tropospheric evidence in Fig 5.4.	[22]Hausfather, Z., Drake, H. F., Abbott, T., & Schmidt, G. A. (2020). Evaluating the performance of past climate model projections. Geophysical Research Letters, 47, e2019GL085378. https://doi.org/10.1029/2019GL085378
36	1	A recent study attributes the bias to inter-annual availability and residual bias in the satellite record. The pre- and post 2000 have temperature records from two separate satellites and the discrepancy in the trends needs to be resolved[23] Chung et al. (using output through 2014 only) confirm the models' too-high warming rates and suggested two issues that might contribute to at least part of the discrepancy: (1) the differential phasing of natural, ephemeral events such as El Niños between models and observations and (2) a possible spurious cooling in UAH and NOAA/STAR satellite datasets around 2000. Regarding (1) we agree that the timing of major events like ENSOs diminishes the fidelity of models-to-observations comparisons for short periods, but now with 46 years of record as well as two major El Niño warm events since 2014 in the observations, the results shown in Fig. 5.7 are quite appropriate for comparison. Regarding (2) Christy et al. 2018 (and later Zou et al 2023) specifically examined the divergence around 2000 between UAH and NOAA/STAR vs. RSS and UW demonstrating that RSS and UW's use of the aging and drifting NOAA-14 satellite relative to the new, highly calibrated NOAA-15 sensor contributed to a spurious warming in RSS and UW. Be that as it may, CWG Fig. 5.7 is clear in noting all models overestimate the tropical temperature trend relative to observations – model trends being even more positive than those of RSS and the two Reanlayses (in addition to UAH and NOAA/STAR).	[23]Chung, ES., Kim, SJ., Sohn, BJ. et al. Multi-decadal climate variability and satellite biases have amplified model-observation discrepancies in tropical troposphere warming estimates. Commun Earth Environ 5, 342 (2024). https://doi.org/10.1038/s43247-024-01510-8

38	3	This is challenge we need to face and work on improving the parametrizations. The new era of super high resolution models would resolve the complex interactions of turbulence, transport and clouds and will provide less uncertainty[24]. However, this can't be used to invalidate the entire set of models, the models are performing remarkably well given the complex system that is being modeled. It should be noted the models do cover the range of the observations and it is not outside the envelope of model predictions. The Report does not address invalidating the entire set of models. Rather we address the fitness-for-purpose of the models for policy making. Fig 5.6 shows that to the extent there is a match with observations, it comes from models with very little CO2 response. “However, this can't be used to invalidate the entire set of models, the models are performing remarkably well given the complex system that is being modeled.” This statement is not supported by the evidence unless and until “remarkably well” is metricized for us to examine and make a determination. The paper cited doesn’t exactly apply to the real world (looking at Fig 1 doesn’t give one much confidence in models), but does give insight into the various models as best we can tell.	[24]Merlis, T. M., Guendelman, I., Cheng, K.-Y., Harris, L., Chen, Y.-T., Bretherton, C. S., et al. (2024). The vertical structure of tropical temperature change in global storm-resolving model simulations of climate change. Geophysical Research Letters, 51, e2024GL111549. https://doi.org/10.1029/2024GL111549
40	4	Part of the problem here may be which part of the stratosphere is sampled and the importance of interannual a variabilities in the lower part of the stratosphere. [25] have shown that including the stratosphere as defined from 25 to 50km there is high confidence that the cooling signal caused by CO2 increase is detectable and beyond the noise levels of the natural and inter annual variability in the lowest part of the stratosphere. We should put this debate to rest. Santer et al. (2023 has been added to the references with this text: Santer et al. (2023) use updated data to show that a cooling trend has not re-emerged in the lower stratosphere.	[25] B.D. Santer, S. Po-Chedley, L. Zhao, C. Zou, Q. Fu, S. Solomon, D.W.J. Thompson, C. Mears, & K.E. Taylor, Exceptional stratospheric contribution to human fingerprints on atmospheric temperature, Proc. Natl. Acad. Sci. U.S.A. 120 (20) e2300758120, https://doi.org/10.1073/pnas.2300758120 (2023).
42	2	Given the large uncertainties in obtaining data over much of the Northern Hemisphere, using a smaller regional analysis to discount the models may be inappropriate. We should that this remains a question we need to resolve developing better datasets with more seasonal and sub-seasonal coverage to test the model on a global scale The reviewer’s points are fine but it is important in the context of this report to point out discrepancies in the way models on some key continental-scale metrics such as, in this case, snow cover. This section directly addresses a region that is important to estimates of the Social Cost of Carbon in the context of agricultural productivity, again reiterating that the models are not fit for the purpose of policy making.	
44	3	This statement from [26] refers to the fitness of global scale models to resolve regional scale features and argues for developing model at higher spatial resolutions. Using downscaling and other techniques additional insights can be gained at regional scales and provide information for a set of 'purposes'. However, we should work on getting to regional and local scales with GCM as quickly as possible. The current model structural forms may not be adequate for resolving all of these issues merely by increasing spatial resolution. Simulating change at regional to local scales depends on getting the internal variability of the ocean correct, which is only partly a resolution issue.	

47	2	Looking for trends or estimating trends in extreme events in current and future climate is not necessarily an attribution study. Estimating frequency, duration and intensity of events helps understand the changing range of the hazard (if there is one). An attribution would be to find to what extent a particular event is influenced or affected by increase in CO2. I would consider these two not to be the same. We explain the distinction between detection and attribution	
47	3	Attributing any single event to changing climate is perilous, agreed. Yes.	
47	5	As noted by [26] there is not yet any strong evidence that LPT <i>[sic]</i> is a fact We have eliminated mention of LPT explicitly, but retain elements of the text surrounding long term variability.	[26]Cohn, T. A., and H. F. Lins (2005), Nature's style: Naturally trendy, Geophysics. Res. Lett., 32, L23402, doi:10.1029/2005GL024476.
57	2	I am not sure how one can conclude that the temperature extremes have decreased based on figure 6.3.4. If I understand correctly the Tmax-Tmin for each year was tabulated and a mean of this difference averaged over the 100+ years was subtracted from these values to get some thing like a anomaly. This anomaly seems to have moved from +3F to -3F over the course of q00 years and now trending upwards again. This suggests to me that there has been significant changes in the extremes over the years and the most recent trend is towards warmer highs? Figure 6.3.3 clearly shows cold extremes have decreased on a centennial scale while warm extremes haven't changed much. In Figure 6.3.4, for each station and each year, the hottest day and coldest night are determined and their difference computed. These differences are then geographically averaged for the CONUS and then an overall average is removed to show the results as a type of anomaly. Reviewer 1 is correct, as indicated in the text, Tmin temperatures are almost universally rising more rapidly than Tmax, hence, the difference (or range) has declined overall. A check of CMIP6 models for the CONUS under ssp4.5 shows half with TMax rising faster than TMin and (obviously) half vice versa – so there is no clear signal from models that matches the observations. The flattening (or slight rise in the metric) in the past 20 years is clearly within the natural range, but does reveal an interesting stair-step pattern with rapid declines centered around the 1940's and 1990's and relatively flat periods in between. An explanation is under investigation, and a leading hypothesis is that there was rapid growth of manufactured surfaces around weather stations in the 1940s. Then, in the 1960s-80s many stations were re-located to relatively rural airports, which then experienced subsequent growth in manufactured surfaces around their weather stations in the 1990s. Thus, rapid nighttime warming in the 1940s and 1990s.	

58	3	The NCA5 is suggesting that the western US is experiencing increase in extreme heat (page 57, para 4); it seems like figure 6.3.5 establishes the fact and not contradict. There was no claim of pervasive (all CONUS) increase in the report We have deleted the sentence “The NCA5 heading “The Risk of Temperature Extremes is Changing” suggests pervasive positive trends are now being observed in threshold temperatures, but that is not evident in the figures above.” It isn’t worth going into more detail in this report	
59	4	The definition of heat wave as consecutive 6 days seems to be a special case. The standard definition is exceedance of 85 or 90 percentile for 2 or more days. I can't check with NCA5 as it was taken down from the web As correctly suggested by Reviewer 1, there are numerous ways to define a heat wave. CWG chose to follow one definition discussed in NCA4 (pg 191) and use 6 consecutive days with Tmax > 90th percentile so as to allow for consistent comparisons. However, changing the parameters will do little to alter the fundamental result that the 1920's to early 1950's contain the major heat wave events for the CONUS.	
60	1,2	Figure 6.3.6 establishes that heatwaves as defined here have increased in the west and have shown increasing trend all over CONUS in the past 50 years. [27] shows the results for the last 60 years and there is little doubt that there is an increase over most of the CONUS, again the NCA5 report is off the web; figure 6.3.7 shows the heat waves are monotonically increasing from the 1960. Including the longer data is only interesting in the dust bowl 1930 camouflage the signal somewhat for the Midwest and central plains. The problem of taking averages over large regions (for example entire CONUS) is that it kills the peak signals and smooths out the emergent climate change indicators. Doing continental averages to look for extremes is really not very useful. Secondly, there is no particular reason to assume that the climate change signal (i.e. the number of heat waves) should showing up 100 years ago, as the CO2 in the atmosphere started to be of significance in the last 50 years. As discussed in the CWG text, the EPA chart is (1) based on nighttime temperatures in the 50 largest US cities and (2) begins in 1961 which was the start of the coolest decade in over 100 years, thereby preconditioning the chart to have an upward trend. Urbanization is most clearly seen in nighttime temperature increases so this does not represent a change in the background climate, but more likely the local climates of cities. Rural areas show less nighttime warming. And, avoiding earlier warm periods does not provide information on the larger scale of natural variability. We have added a sentence at the end of Section 6.3 “Irrespective of the ultimate cause of regional trends, heatwaves have important effects on society which must be addressed, as we discuss in Chapter 10.”	[27]https://www.epa.gov/climate-indicators/climate-change-indicators-heat-waves

61	4	averaged over all stations in the region, none of these trend parameters is statistically significant'. This is again how one would be looking at statistics of extremes in precipitation. As we know, precipitation is highly heterogenous and location dependent. As observed there are trends even with the approaches chosen by the authors of this study compared to NCA5 and averaging that over and saying there is no trend seems disingenuous. We summarize the site-specific trends as well as the regional average. The rationale for looking at the regional average is that a GHG signal should cover a wide area.	
62	2	same argument as above We summarize the site-specific trends as well as the regional average. The rationale for looking at the regional average is that a GHG signal should cover a wide area.	
63	box	again the issue here is that we are talking about events that are happening in a short-time and over a small region. Averaging over time and space and develop statistics is probably not appropriate when we are talking about events such as the recent flooding event in Texas. If you average that event over 30 days, it will seem unremarkable. Extreme event totals are 1-day to 5-day,s depending on section discussed. The point being made in the Box is that if you use a too-short record you may underestimate natural variability. We're not sure how the reviewer's comment challenges this.	
64	1	As noted in NCA5 and shown in the analysis presented in figure 6.4.4 there is a clear trend of increase in extreme precipitation in 12 of the 27 stations analyzed. Again averaging over the entire region is not the best method for picking extreme precipitation events that are local both in time and space. We summarize the site-specific trends as well as the regional average. The rationale for looking at the regional average is that a GHG signal should cover a wide area. Also in this case we point out that the NE behaves differently than other regions.	

69	2	However, there is evidence that flash droughts, which last weeks have increased over the Northeast and Midwest [28] The paper referenced by Reviewer 1 begins with data so recent (1999) that it cannot provide evidence for long-term changes in drought as evidenced in the US Drought Monitor (DM) even though it suggests an increase in "flash droughts" over that period. Keep in mind, the DM is a product of subjective interpretation and objective measures - objective measures that have changed considerably during the past 25 years – thus is not metrically consistent. (One of the CWG authors was an official contributor to the DM for 15 years.) One would wonder what would the 1920's. 30's and early 50's reveal if the DM was operational back then? A more consistent metric is provided in CWG Fig. 6.7.1.	[28]Ronald D. Leeper, Rocky Bilotta, Bryan Petersen, Crystal J. Stiles, Richard Heim, Brian Fuchs, Olivier P. Prat, Michael Palecki, Steve Ansari
70	2	More recent analysis indicate forest loss due to wildfire accelerating over the recent past[29]. In particular there has been an increase in extreme fire radiative power with a 2 fold increase from 2003 to 2023 (period of satellite data availability)[30][31]. However, that these fires are not out-of-sample and there is a fire deficit as shown in figure 6.8.2 should be acknowledged. But this doesn't alleviate the concern that wildfire is leading to lot of socio-economic concerns and needs to be addressed[32] New sentence added: However there is evidence that the intensity of fires in some regions is worsening (Cunningham et al. 2024) and that wildfires resulted in a net loss of global forest cover over 2001-2019 (Tyukavina et al. 2022).	[29]Tyukavina Alexandra , Potapov Peter , Hansen Matthew C. , Pickens Amy H. , Stehman Stephen V. , Turubanova Svetlana , Parker Diana , Zalles Viviana , Lima André , Kommareddy Indrani , Song Xiao-Peng , Wang Lei , Harris Nancy; Global Trends of Forest Loss Due to Fire From 2001 to 2019, Frontiers in Remote Sensing.Volume 3 – 2022,2022. [30]Cunningham, C.X., Williamson, G.J. & Bowman, D.M.J.S. Increasing frequency and intensity of the most extreme wildfires on Earth. Nat Ecol Evol 8, 1420–1425 (2024). https://doi.org/10.1038/s41559-024-02452-2 [31]Patrick H. Freeborn, W. Matt Jolly, Mark A. Cochrane, Gareth Roberts, Large wildfire driven increases in nighttime fire activity observed across CONUS from 2003–2020, Remote Sensing of Environment, Volume 268, 2022,12777 [32]Parks, S.A., Guiterman, C.H., Margolis, E.Q. et al. A fire deficit persists across diverse North American forests despite recent increases in area burned. Nat Commun 16, 1493 (2025). https://doi.org/10.1038/s41467-025-56333-8
71	3	The question of forest management and its role on wildfire frequency and intensity is interesting and deserves further study. We agree	
80	1	The global mean sea-level was increasing at a rate of 0.08 inches/yr in 1993 compared 0.18 inches/yr in 2023, almost double the rate[33], which is approximately what is needed to meet the NOAA projections by mid-century and seems plausible. We discuss the NOAA projection for a specific site in the context of high-quality, long-term tide gauge data, but offer no comment on its plausibility. Extrapolating satellite-derived accelerations post 1993 is a perilous business given the well-documented variability of GMSL rates on multi-decadal scales.	[33]Hamlington, B.D., Bellas-Manley, A., Willis, J.K. et al. The rate of global sea level rise doubled during the past three decades. Commun Earth Environ 5, 601 (2024). https://doi.org/10.1038/s43247-024-01761-5

88	3	A possible reason the method used by IPCC (optimal fingerprinting) can be considered to address McKitnick criticism is in [34] We cite Chen et al. They mostly just reiterate the same points as McKitrick (2022). They propose a resolution to one part of the problem but it requires very restrictive assumptions.	[34]Chen, H., Chen, S.X. & Mu, M. A statistical review on the optimal fingerprinting approach in climate change studies. <i>Clim Dyn</i> 62, 1439–1446 (2024). https://doi.org/10.1007/s00382-023-06975-5
92	4	The role of clouds remains the single most uncertainty in climate modeling, I am glad this was acknowledged here. Agreed	
93	3	The substance of this paragraph was addressed in my comments in earlier sections. Some of the claims made here are either exaggerations of the usual practice (RCP8.5 being referred to as BAU) or the comment about not fit for purpose (a comment extracted from a publication that is calling out for cloud resolved models. Presumably the reviewer agrees RCP8.5 should not be used as a BAU scenario, so we are in agreement. The Palmer and Stevens paper nonetheless says the models are not currently fit for purpose, an observation echoed by the Nissan et al paper cited..	
105	2,3, 4,5	The problem with both the FACE studies and the soybean. Maize and wheat studies cited here are that they don't consider the effect of increase in temperature, changes in precipitation, humidity and other environmental factors along with CO2 increases. These compound effects have been shown in wide number of studies [35] [36][37][38][39]. A meta analysis of the compound effects shows that increase in CO2, along with temperature, precipitation changes effects the quality of the cereal and yields[40]. Another recent study evaluated the impacts on C3 and C4 crops and conclude that CO2 enrichment for C3 crops could increase but will be compensated by temperature increase. CO2 fertilization effect was found to be small for C4 [41]. It is important therefore that we consider the compound effects on crop yields and not just focus on CO2 enrichment. The reviewer is correct that compound effects need to be considered, and indeed one of the problems with a lot of econometric papers on climate change and agriculture is they only look at heat and ignore the CO2 enrichment (Taylor and Schlenker being an important exception). Since our remit was impacts of CO2 emissions a brief discussion of FACE plot experiments and other CO2-only experiments is on topic. We discuss meta-analysis of multivariate (compound) experiments in Section 9.3.	[35] Ruiz-Vera UM, Siebers M, Gray SB, Drag DW, Rosenthal DM, Kimball BA, Ort DR, Bernacchi CJ. Global warming can negate the expected CO2 stimulation in photosynthesis and productivity for soybean grown in the Midwestern United States. <i>Plant Physiol.</i> 2013 May;162(1):410-23 [36] Levine LH, Richards JT, Wheeler RM. Super-elevated CO2 interferes with stomatal response to ABA and night closure in soybean (<i>Glycine max</i>). <i>J Plant Physiol.</i> 2009 Jun 1;166(9):903-13. [37]Večeřová K, Oravec M, Puranik S, Findurová H, Veselá B, Opoku E, Ofori-Amanfo KK, Klem K, Urban O, Sahu PP. Single and interactive effects of variables associated with climate change on wheat metabolome. <i>Front Plant Sci.</i> 2022 Oct 10;13:1002561. [38]Thomas, J.M.G., Boote, K.J., Allen, L.H., Gallo-Meagher, M. and Davis, J.M. (2003), Elevated Temperature and Carbon Dioxide Effects on Soybean Seed Composition and Transcript Abundance. <i>Crop Sci.</i> , 43: 1548-1557. https://doi.org/10.2135/cropsci2003.1548 [39] Lesk, C., Anderson, W., Rigden, A. et al. Compound heat and moisture extreme impacts on global crop yields under climate change. <i>Nat Rev Earth Environ</i> 3, 872–889 (2022). https://doi.org/10.1038/s43017-022-00368-8 [40] Ben Mariem S, Soba D, Zhou B, Loladze I, Morales F, Aranjuelo I. Climate Change, Crop Yields, and Grain Quality of C3 Cereals: A Meta-Analysis of [CO2], Temperature, and Drought Effects. <i>Plants.</i> 2021; 10(6):1052. https://doi.org/10.3390/plants10061052 [41]Rezaei, E.E., Webber, H., Asseng, S. et al. Climate change impacts on crop yields. <i>Nat Rev Earth Environ</i> 4, 831–846 (2023). https://doi.org/10.1038/s43017-023-00491-0

106	1	Taylor and Schlenker 2021 also note that 'Climate change will likely have negative impact on agriculture in aggregate, especially in regions exposed to extreme heat. And the CO2-driven yield increases may be offset by effects on food nutrition and quality'. However, the results for US have been a net positive in the recent past but not true in the lower latitudes. Extreme heat may be a net negative, but thus far the overall effects have been positive. Regarding nutrition loss see Section 9.4	
111	1,2	The criticism of NOAA Billion dollar map is likely warranted as it was never completely transparent how the data was generated. However, changing the baseline assumption and refactoring the data using a different set of criteria to make the effects smaller also doesn't make sense. We should continue collecting this data and make the data accessible for researchers and peer review. Figure 10.1 doesn't address these issues, it is another methodology with unknown provenance of the data. We agree that data collection, dissemination and transparency are key. Fig 10.1 is traceable as an indicator though we don't regard it as the final word on the subject either. .	
117	3	Climate change can be expected to increase cold weather extremes in regions that have not been exposed to these effects The reviewer's point is unclear.	
118	3	The same Nobel prize winning model in its most recent study concludes that [42] "We conclude with three results relevant for climate policy. First, both current policies (base run) and the extended Paris Accord fall short of limiting global warming to 2 °C or to the cost-benefit optimal level. Second, the economic stakes in global climate policy are substantial, with estimated net present value of economic benefits around \$120 trillion from the cost-benefit optimal policy. Third, once differences in discounting are considered, the baseline DICE-2023 estimate of the social cost of carbon (\$66/tCO₂ for 2020) aligns closely with other recent estimates". Obviously this is the latest and the current version of the model and these results are quite different from thus discussed on this page. These conclusions should also be included in this discussion to avoid selective reading of the literature. We discuss Barrage and Nordhaus (2024) on p. 121.	[42]L. Barrage, & W. Nordhaus, Policies, projections, and the social cost of carbon: Results from the DICE-2023 model, Proc. Natl. Acad. Sci. U.S.A. 121 (13) e2312030121, https://doi.org/10.1073/pnas.2312030121 (2024).

120	1	Similar empirical studies [43] point to "Using an empirical approach that provides a robust lower bound on the persistence of impacts on economic growth, we find that the world economy is committed to an income reduction of 19% within the next 26 years independent of future emission choices (relative to a baseline without climate impacts, likely range of 11–29% accounting for physical climate and empirical uncertainty). These damages already outweigh the mitigation costs required to limit global warming to 2 °C by sixfold over this near-term time frame and thereafter diverge strongly dependent on emission choices. Committed damages arise predominantly through changes in average temperature, but accounting for further climatic components raises estimates by approximately 50% and leads to stronger regional heterogeneity. Committed losses are projected for all regions except those at very high latitudes, at which reductions in temperature variability bring benefits. The largest losses are committed at lower latitudes in regions with lower cumulative historical emissions and lower present-day income". This study uses more of the daily temperature precipitation from 1600 hundred locations world wide instead of global means. There are numerous studies that show the cost, many described in the COP 21 and follow-on meetings The Kotz et al. paper is subject to a cautionary notice at the Nature website that “the reliability of data and methodology presented in this manuscript is currently in question.” https://www.nature.com/articles/s41586-024-07219-0 The literature showing growth effects of temperature increase is pretty robust. And though we don’t cite it, there is a new paper just accepted at Climate Change Economics by McKittrick and Devina Lakhtakia adding to the evidence using 2 newly-constructed global data bases.	[43] Kotz, M., Levermann, A. & Wenz, L. The economic commitment of climate change. Nature 628, 551–557 (2024). https://doi.org/10.1038/s41586-024-07219-0
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Page	para	Comment or Suggested Edit
		The report indicates numerous examples of uncertainties in climate science. It would be extremely helpful if these undertainties were made more explicit, listed in a concluding section, and prioritized in some way - what are the top 10 priority research areas? If the opening remarks by Secretary Wright and the title pointed to uncertainties and the need for more research, I believe this report will be better received. As I read the report and left review comments below, I bolded items where I gather the authors imply that research is needed. Consider including these kinds of statements throughout and adding a summary. An interesting suggestion but with the time constraints this must be deferred to a separate report.
viii	3	This would be more correct: "Some scenarios of future CO2 emissions overestimate observed levels" Sentence has been removed
viii	5	This would be more correct: Some detailed climate models run “hot” in their simulation of the climate of the past few decades, while many have underestimated the amount of surface warming. More research is needed to select the most skillful and reliable models. The need for more research on model development is implicit. Again, this would be a good topic for a separate report.
viii	6	Need reference for: "Claims of increased frequency or intensity of hurricanes, tornadoes, floods, and droughts are not supported by historical data." More research is needed to identify how frequency and intensity of weather events are affected by environmental conditions. The ES statements are all supported by the document chapters; references will be added to specific sections.
4ff		It is misleading to separate the photo-chemical effects of CO2 from the temperature effects. Extreme heat is hard on plants, causing them to lose water, close stomata, etc. It depends on the plant and the degree of heat. More research is needed to understand how the temperature (mean and variability) affects plant productivity and resilience. 1st paragraph of Section 2.1, we added sentence “Here we focus just on CO₂ fertilization; research on combined effects due to temperature and precipitation changes are discussed in Chapter 10.”
7		Again it is misleading to separate the CO2 and the temperature effects on the oceans. The warming surface waters is having significant impact on ocean fish and habitats due to the overall increase in global temperatures This section is specifically on changing alkalinity. We haven’t included a review of temperature effects on fish populations: it is one of the impacts topics we were not able to survey.
14	4	More accurate to say "because their effect remain largely unknown". Good examples include natural aerosols (sea salt, dust, biogenic aerosols). Are there others to mention? More research is needed to understand radiative effects of both natural and anthropogenic sources of radiative variability throughout the atmospheric column. Sentence added: “Natural sources of global energy imbalance other than volcanoes and total solar irradiance (TSI) are not included in these graphs because their effects remain largely unknown.”
17	figure	What scenarios are the models using in this figure? SRES, as stated in text, also others including Hansen A,B,C and others as described in the Hausfather et al. paper.

19		Vegetation is only one way that CO2 is accommodated by land processes, the other is through soils and microbial processes Microbial dynamics is complex and challenging to understand but may also be a way to boost CO2 absorption by soils (which also enriches the soil nutrients!). More research is needed to better understand how plants and soil systems remove CO2 from the atmosphere. Noted.
19	5	More research is needed to improve the understanding and representation of land systems, carbon and nutrient fluxes in models. Noted.
20		Carbon uptake by oceans and ocean ecosystems is less well studied and modeled. The lack of spread of carbon in ocean models may result from insufficient information, ocean biogeochemistry, ecosystems and model development. More research is needed to study and model carbon, nutrient and ecosystem processes and dynamics in ocean models. Noted.
		More research is needed to map warming trends in urban, non-urban and other environments and to ensure accurate representation of regional and global trends in temperature. Noted.
27	2	"This practice" - need to clarify whether this refers to "emergent property" or discarding. I believe the authors mean the latter, but it should be made more clear Sentence rewritten: "Parameter tuning to yield an ECS target was commonplace for the models used in AR4; modelers have moved away from this practice with time."
27	3	"assumed positive cloud feedback" - this is an emergent property too, based on simulation/observation. Should be rephrased to not use the word "assumed". Further research is needed to better understand and model how clouds change with temperature and what the feedback effects are on the radiative balance. Sentence has been rephrased without the word "assumed".
		Further research is needed to narrow the uncertainty on climate sensitivity, both using models and observations. Noted.
33		The text and figure refer to 33 models, which would include the best and worst. How much does the uncertainty/range change for a subset of best-performing models? The modeling community doesn't have a leaderboard of best-to-worst models. Some of the "prestige" models from the US and UK have very high sensitivities, but they are preferred by many users for particular applications.
34	figure	How many models are included in each case? High ECS 14, Medium ECS 11, Low ECS 13. This has been added to Figure caption.
36	figure 5.4	How are the lower and mid-troposphere defined? Standard definitions in the paper: LT surface to ~9km, MT surface to ~15 km. Added in the Fig caption.
37	4	"excess amplification" - amplification of what? And Figure 5.6 shows tropics, is this bias only tropical? Sentence changed: "Another important model-observational discrepancy is the excess amplification or warming with altitude..." The bias is only observed in the tropics but the amplification pattern is only predicted in the tropics. Also bear in mind the tropics is nearly half the atmosphere and is where most solar energy enters the climate system.

38		Further research is needed to improve how models represent clouds and dynamics; additional observations are also needed to improve these representations. Noted.
42		Further research is needed to improve how models represent planetary albedo to align with observations. Noted.
		The greater concern with hurricanes is the amount of moisture they carry and drop after landfall, i.e. flooding. While this is an active area of research, it is worth noting that this may be the bigger issue for hurricane change with warming This is covered in the AR6 assessment as quoted, as it's one of the intensity metrics. Currently too little data to assess for trends.
56-57		The concern for many are the extreme hot temperatures without night-time cooling that provides an opportunity for recovery. This section doesn't address this. In this regards, the focus on the difference between extreme hot and extreme cold is misleading when generalizing about decrease in extremes (figure 6.3.4) - the decrease is because we don't have as much extreme cold. This metric is covered by the data in Sct 6.3.3.
60		Combining heat and humidity as a measure of extreme heat is not unusual since it is this combination that is most impactful to human health - the body cannot cool if the humidity and heat are both high. Since a warmer atmosphere holds more moisture, and CO2 causes heat (and therefore moisture) to increase, this combination is a relevant assessment of the effects of CO2 on extreme conditions that make it difficult for people. Also combining with urban regions is helpful since that is where most people live. These points are not made in the report and are important. Sentence will be changed to read: "Given the heatwave definition and urban focus, while these increasing values since 1960 point to a growing human impact they are not informative about long term trends or..." Added sentence at end of paragraph (Irrespective of the ultimate cause of regional trends, heatwaves have important effects on society which must be addressed, as we discuss in Chapter 10), which should address reviewer concerns.
		Patterns and variability of precipitation are poorly understood and models are particularly challenged to represent and predict precipitation, further research in this area is needed Noted.
		The authors rightly describe the extreme uncertainty regarding sea level rise. It would be helpful to add some information about the complex, highly nonlinear and uncertain processes involved with ice-sheet dynamics and ice-sheet - ocean interactions that are especially key for Antarctica. More research is needed to study and model ice sheet dynamics and ice-sheet ocean interactions. Noted. Canvassing ice sheet and ocean dynamics in that much detail beyond our scope but would belong in a separate report.
84	3	Further research is needed on climate variability, effects of ocean circulation, solar variability, model simulation of variability and statistical methods. Noted.
87-88		Anthropogenic aerosol effects may also influence the inflections in temperature in ways that are challenging to account for Noted.
91	2 and 3	Reductions in aerosol indirect (cloud brightening) effects may also explain the reduced planetary albedo, not just from ships but from reduced fossil fuel aerosols coming from the continents, China and east asia especially. This paper describes the reduction in aerosols https://www.nature.com/articles/s41612-023-00488-y This is another area that needs further research! Noted.

94	table 8.1	What are the numbers in the 3rd column? Please include in the caption. Good point. Added to caption: “Numbers refer to footnotes in original source that specify locations or region-specific confidence levels.”
95	2	I don't see an inconsistency between what Ch 11 and Ch 8 say. The first is about precipitation, droughts, tropical cyclones, heat - overall. The 2nd (ch 8) is about specific types of events in specific regions. Suggest to soften the statement about the contrasting assertions. Sentences at issue are “Evidence of observed changes in extremes and their attribution to human influence (including greenhouse gas and aerosol emissions and land-use changes) has strengthened since AR5, in particular for extreme precipitation, droughts, tropical cyclones and compound extremes” versus “No evidence of emergence in the historical period of a change in river floods, heavy precipitation, drought, fire weather, severe wind storms, and tropical cyclones”. These statements are manifestly in conflict.
		The science of attribution of extreme events is challenging and computationally expensive; this is an area where further research is needed with potential to use AI to improve statistics Noted. Not sure about the computationally intensive point: many just run univariate GEV models and overinterpret the results. AI won't fix the bad methodology.
104		This section seems to gloss over many key points. Certainly there are limits where extreme heat and drought (water is key) could be detrimental to crops. It also depends on which crops. There is extensive literature on how certain crop viability is shifting. So a region with particular crop experience and cultivation may no longer be able to sustain that agriculture. There is cost to shifting crops across regions and farmers that needs to be accounted for. And water is key - is there enough water in various regions for energy (power plants need water) as well as agriculture when conditions are very hot for sustained periods? The comment seems to be about the validity of the underlying literature rather than our summary of it. The econometric literature tries to synthesize patterns over large areas to get at overall trends, rather than the agronomy focus on specific sites and crops.
111		Severe weather continues to disproportionately impact lower income communities as well as business that requires outdoor exposure. A thorough analysis would need to include these points and I recommend adding this caveat to the section. This is specifically addressed in Section 10.3.2
		Related to my previous comment, deaths due to extreme heat conditions appear to be increasing, particularly for certain populations and for those with underlying health conditions (which can be hard to detangle when attributing mortality). For example https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2792389 Again this topic is specifically addressed in Section 10.3.2
114		An additional concern is if the grid fails under either extreme heat demands or cold/severe-storm events, the impact on communities will not be uniform and depends on grid infrastructure which can be better in more affluent communities Good point. We don't discuss what makes for grid stability versus instability, especially in the context of many jurisdictions closing reliable power plants and opting for intermittent renewables, but the correlation between extreme weather and the likelihood of power failure is an important topic.
		The impacts of sea level rise and coastal inundation on coastal communities and in low-lying countries should be addressed. This will have impacts particularly on certain countries/regions but also on world economics Good point. The topic is germane but runs into the limits of what we can cover in our limited time. To some extent it is covered in the economics chapter since IAM damage functions include effects of sea level rise on coastal areas.
		Research is needed to better understood the likelihood and impacts of various tipping points, including changes to ocean circulation patterns, ice sheet acceleration, sea-ice loss, die-off of tropical forests, thawing of permafrost, etc. Noted. Hopefully our discussion clarifies the different types of “tipping point” topics.

		Do the authors think it worthwhile for private or public research, such as at DOE, to seek breakthrough technology that might effectively remove massive amounts of CO2 from the atmosphere? No comment
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Chapter Number	Page Number	Approximate Paragraph Number	Comment or Suggested Edit
	i		In general, criticism and re-analysis of past research is always welcome. This report summarizes some substantial concerns from a small group of researchers. The report should be reframed to reflect this and I provide some suggestions in a later comment. I suspect that simply publishing this report will not offset the hundreds of reports and publications on CO2 and Climate that have come before it. But, new analyses and communication within and outside the research community could make a positive difference, should the findings in this report be substantiated. The DOE Office of Science BER could be provided an opportunity to address the research uncertainties in this document in a thorough and robust manner. Noted.
	iii	1	As someone who used to read the DOE reports on CO2 as a graduate student in the 1990s and then conducted numerous analyses of carbon on many topic areas which were later confirmed by numerous other analyses, it seems somewhat cavalier for DOE to issue one brief conclusive report on the "impacts of carbon dioxide emissions". I suggest the following option: Change the title to "Topics of Uncertainty on the Impacts of Carbon Dioxide Emissions on the U.S. Climate" or " An Assessment of CO2 Impacts on Climate to Guide Future Research ", and then use this report to drive research/analyses for each report chapter which would conclude in separate topical reports that could be finished within a year or two. In doing so, the DOE would positively contribute to addressing some of these standing issues and hopefully enable the nation to move forward in a more productive manner. Noted. New title: "A Critical Assessment of the Impacts of Carbon Dioxide Emissions on U.S. Climate."
	vii	Forward	I appreciate the perspective. It could be useful to add or edit the Secretary's Forward to indicate that " the report has been purposefully commissioned to researchers with alternative perspectives in an effort to address these perspectives and provide some closure for the American public, the US Economy, and US energy policy. " I suggest this, because it will be very obvious that a handful of skeptics were chosen out of literally hundreds of extremely active and well-respected scientist. Addressing that upfront will immediately reduce criticism, and hopefully generate a positive environment to address these issues. Everyone would like to see convergence of findings on these issues. Noted. The suggested sentence is not well-phrased, but the reviewer is correct that everyone will see the names and know that the document is coming from a particular perspective. The problem is no such concerns were expressed when people with known biases got put in charge of NCA or IPCC chapters. The path to convergence starts with the wider community admitting that they've been keeping a lid on the necessary discussions. In any event, we do not have any control over the Secretary's Foreword
	viii	2	Any increase in greening from additional CO2 will likely be more than offset by longer growing seasons with higher temperatures (i.e., more days over 100). This causes serious risk to the US midwestern "bread basket", which is why this has been considered a national security concern. The data supporting this trend has been published a few times now in Science by a fellow out of Stanford, among others. Sources: Lobell and Field. 2007, doi: 10.1088/1748-9326/2/1/014002; also Sloat et al. 2020, doi:10.1038/s41467-020-15076-4 has a thorough introduction with many citations. The effects, including compound effects, on Agriculture are addressed in Ch 9

	viii	3	My understanding is that the upper bound of emissions (i.e., very high) is business as usual, with no mitigation, and a high-end of growth. It's a worst, yet plausible, case scenario. Similarly, the lowest emissions (i.e., very low) scenario includes technologies that don't yet exist including significant CO2 removal. Both are there to understand plausible extremes. The more likely scenarios are the low to high scenarios. I'm sure researchers are open to revisiting how things are bounded and presented if there are reasonable objections. It seems that within the expert community people are quick to set RCP8.5 aside as a fringe scenario. The problem is it dominates the impacts literature and the media coverage thereof. So the critical discussion herein is needed.
	viii	4	This may be true. But data driven analyses may not capture anticipated feedbacks. They attempt to by design. Limited by data especially ocean heat content, but they take it into account.
	viii	6	I am a big fan of data and meta-analysis. However, I'll note that I do not think forest management practices are overlooked. In fact, it is one of the main driving story lines (i.e., too much fuelwood exists, so we need to harvest more forest). There remains strong debate on the efficacy of fuelwood removal over large areas as an effective means of wildfire reduction. The key to this analysis is to look at whether the extent (not the numbers) of fires has grown and whether the burned areas are returning to forests or returning to brush or grassland. If it's the latter, then that is more likely due to regional changes in climate (temp and precipitation). Again the issue may be what experts discuss among themselves versus what's out there publicly.
	viii	8	I think we can point to sea-level rise in south florida, crop damage, and disease vectors fairly easily. I'm not aware of what costs are associated with these 3 items, but I suspect it's quite large. Dealt with in Ch 11 on economic costs and the SCC.
	viii	9	Yes, this is an important paragraph. Most scientists are not activists. Just because there is a science finding, scientists don't expect that to turn into policy. The public and the democratic system can determine the policy using an evidence-based risk/benefit analysis, just as noted here. Opening up this conversation (which should have been done decades ago) would be welcome and would better engage the public on this issue. DOE could in fact take a leading role here and help address a major national issue. A point of sincere agreement.
1	2		This is all generally correct. I would like to think this is common knowledge. Yes but bears repetition
2	4	1	Why use studies based on satellite sensors? I'm quite sure there are studies (again, out of Stanford) that use historic yield data (county-scale USDA data and global FAO data) with associated temperature and precipitation data. Those analyses do not agree with your findings here, I think. But, we can certainly pose these questions to our scientists that study and develop land models and develop a report based on all available data. I'll also note that for sometime data synthesis wasn't considered fundamental science and was therefore largely ignored. Enabling the researchers to conduct robust data analyses on this and other topics would be largely welcomed. See Ch 9 on Ag effects for the studies on yield data.
2	5	Figure 2.2	All data is interesting and useful for perspective and understanding. But isn't the main question whether we are driving up CO2 and temp at a rapid pace in the post-industrial era? This graph does not help answer that question. Figure 2.2 has been deleted.

2	7	3	Stating that increased aridity in drylands will not lead to decreased productivity seems a bit questionable. We can point to precipitation gradients from high to low precipitation that supports forests to grasslands to shrublands, respectively. Less water in general will mean less productivity; this can be seen in different forest compositions as well. The authors cite Zhang et al. (2014), but Zhang's main point is that the direct CO2 effect may be causing greening in drylands that offsets the decreased precipitation. This may be more specific to dryland vegetation, and Zhang et al. specifically state that this finding is relevant to north-east Brazil, Namibia, western Sahel, Horn of Africa, and central Asia. Zhang 2024, not 2014. The point here is to explain benefits of higher CO2 in terms of crop water productivity. Zhang acknowledges increase in desertification (as we note) but points to a global pattern of greening in arid areas.
2	9	3	I do not disagree with this observation of a decline effect, and I have seen it in some of the early biomass energy analyses that appeared in prominent journals and were then corrected over a few years. While it is unfortunate that some try to grab headlines with unsupported assumptions, it does seem that other researchers tend to provide counter arguments and analyses fairly quickly, indicating that the system does in fact work fairly well. Yes, part of the problem is the later counter-evidence gets relatively little attention, hence this report.
3	19	last	Yes, CO2 uptake by land processes have uncertainty associated with them. It's worth noting that DOE researchers (many of whom are retired now) were world-leading and making progress in this area, but nearly all work on CO2 uptake and emissions stopped 10-15 years ago due to political pressure and political concerns. The Carbon Dioxide Information and Analysis Center at ORNL, now cancelled, was a main contributor to the Global Carbon Project. Now the US is woefully behind and ceding expertise on this to the Europeans (as cited in this report). We are also ceding expertise on carbon monitoring via satellites to other countries. There's nothing necessarily wrong with this if this is where the US wants to go, but it's important to recognize that we have lost significant capacity due to policy changes over many years. We specifically recommend the government increase its focus on basic climate monitoring and data dissemination in the "Concluding thoughts" section. The CDIAC was very valuable and we lament its closure.
5	44	1	Some of the early work on this topic was done by researchers at Stanford. But there are plenty of other papers. Here's one that came up in a quick search: https://www.pnas.org/doi/10.1073/pnas.0906865106 We discuss this paper in Ch 9.
5	44	1	Contradicting a number of large meta-analyses on the topic of decreased yields with increased temperature is ok. That's what science is all about. But it's going to have to be done in a more robust way than a couple paragraphs here with one or two citations. This section concerns temperature trends in the corn belt; the discussion of yields is in Ch 9.
6	47	chapter summary	This is very important. I have not dug into the data on extreme storm data (both numbers and intensity). Getting researchers together that disagree on a topic, analyze the data, and publish findings together can be very productive. DOE could sponsor a workshop and bring together a broad range of experts and find answers to extreme weather trends. Good idea

6	47	chapter summary	I conducted some analyses on wildfire years ago. I saw the bias in the university textbooks and in the wildfire working groups, who essentially went by textbook teachings. It was rare that people went back to the original data. The last time I checked the actual data (a good 10 years ago), I found that...you're correct...the number of fires had not changed much. What does seem to be changing is that the extent of fires has grown, and this is mostly attributable to hotter and drier conditions. I do not believe there is more fuel load now than there was before the US was settled. Arguing that harvesting will decrease fire is nonsensical; you have no idea where the lightning is going to strike and subsidizing the thinning of all forest in the western fire zone would be cost prohibitive. I think we need to stop using wildfire management as a justification for harvesting. If we want to harvest more, than do it, and stop using fuel load arguments (which is more of a concept than proven reality) as a reason to do it. The biggest issue here is encroachment of housing communities into the Wild-Urban Interface (WUI) and how we want to handle that with policies. Fire is really only bad if it's burning someone's house down. Otherwise, it's a natural progression in forest dynamics. Sources: Campbell et al. 2012. doi:10.1890/110057.; Schoennagel and Nelson. 2011. doi:10.1890/090199. Excellent comments. It's a big topic we can only glance at but we are trying just to get some pertinent data into the discussion.
6	57	6.3.2	The NCA5 is cited here and elsewhere. However, the USGCRP website that hosts the NCA reports has been removed. Hence, there is no way to read and review the referenced findings. This DOE report is therefore arguing against something that no longer exists, and that may appear questionable. Noted. Out of our control.
7	74	2	Given the satellite observed ice sheet dynamics, I'm not sure that ice sheet retreat is that hypothetical. Our reference is to hypothetical instabilities, i.e. massive disintegration.
7	all		This is the first time I have seen all sea-level rise estimates discredited by an offset from land subsidence. This is certainly a global dynamic that we would want to capture and understand in Earth system models, and DOE can look into this further with analyses and experiments if necessary. Noted.
8	86	all	This and other chapters cite the IPCC AR6. The IPCC provides a global process to address the issues and uncertainties in this report. Perhaps this report can set a path for pivoting research and re-engaging in a useful manner. That's a big ask.
9	104	chapter summary	The last sentence in this summary is not necessarily accurate. The authors cite Ainsworth and Long (2020) with respect to increased CO2 effects on crops. But, Ainsworth and Long (2020) indicate that increased temp and decreased precipitation will have negative impacts on crops, while increased CO2 may offset some of those negative effects. It is the impact of CO2 on climate and the subsequent impact on crops that is the concern; not the direct effect of CO2 on crops. Re written: "There is reason to conclude that on balance climate change has been and will continue to be neutral or beneficial for most U.S. agriculture"

Chapter Number	Page Number	Approximate Paragraph Number	Comment or Suggested Edit
2	3	2.1.1, para. 2	Zheng not in reference list. Do you mean Zeng? Yes, fixed.
2	3	2.1.1, para. 3	"nearly double"? Why exaggerate? - it's a 76% increase. And they reported that future increase in GPP in extra-tropical northern hemisphere (e.g., U.S.) for [CO ₂] from 300 to 600 ppm of 42%, or 32% more than previous predictions (not 76%). <u>Replace "nearly double" with "much larger than"</u>
2	3	2.1.1, para.1	Zhu also explained that "other factors (OF) not considered in models, such as forest management, grazing, changes in cultivation practices and varieties, irrigation and disturbances such as storms and insect attacks, can be a cause of mismatch between observed and simulated LAI trends.... OF contributes the most to the observed LAI trend over 25.0% (increase) and 5.3% (decrease) of the vegetated area" We don't claim CO ₂ is the only factor.
2	3	2.1.1, para.2	This report is meant to focus on the U.S., so it would be more appropriate to discuss greening trends in the U.S. Fig. 2.1 shows that the trend in LAI across much of the U.S., with the exception of the Southeast, is less than the global average. Negative OF effects are mainly found in northern high latitudes (e.g., Alaska). Growing season warmth is the dominant factor in cold regions (10.1038/s41558-018-0258-y). Significant browning also is occurring in parts of Alaska (10.1175/EI-D-20-0025.1) But the effect is still positive. In Ch 9 we discuss US-specific evidence concerning CO ₂ and crop yields.
2	3	2.1.1, para.2	Greening of the Arctic can have important adverse consequences. Direct observations support that warming and increased vegetation cover in the Boreal-Arctic region showed a "robust increasing trend of CH ₄ emissions (+8.9%) with strong inter-annual variability. The majority of emission increases occurred in early summer (June and July) and were mainly driven by warming (52.3%) and ecosystem productivity (40.7%)." Yuan et al 2024 (10.1038/s41558-024-01933-3). We don't claim it's good or bad, only that it's been observed.
2	3	2.1.1, para.3	Wang et al 2020 (10.1126/science.abb7772) report a decline over recent decades in CO ₂ effects on global photosynthesis, possibly due to increasing nutrient interactions or interactions with effects on LAI. It's a controversial finding that attracted skeptical comments in <i>Science</i> regarding the validity of the satellite data and the statistical methods used https://www.science.org/doi/10.1126/science.abg2947 https://www.science.org/doi/10.1126/science.abg4420 https://www.science.org/doi/10.1126/science.abg5673

			While the authors in reply defend the satellite data, they acknowledge they may not have dealt adequately with confounding non-CO2 factors. So, it seems premature to invoke this result.
2	4	2.1.2	Much of this information in this section is appropriately covered in chapter 9 on agriculture. Chapter 2 purports to have a wider focus (global and environment responses), so it should not dwell on responses of individual crop plants (crops account for only 15% of global GPP). There has been plenty written on ecosystem response to eCO2, but evidence such as Fig. 2.3 is not relevant. All analyses of direct eCO2 effects reveal an overriding interaction with other environmental factors (nitrogen and temperature), and global models show that eCO2 only partially compensates for the negative effects of climate change on ecosystem carbon response. We struggled with how to divide material up in Ch 2 and Ch 9. The solution we came up with was that here we are addressing direct CO2 effects, namely CO2 fertilization; later we discuss Ag effects in more detail. Not everyone paid attention in high school biology. Figure 2.3 serves as an illustration of a point that non-specialists are often surprised to learn, namely that CO2 is plant food.
2	4	2.1.1, last para.	Zhang, 2025 (10.1016/j.ecolind.2025.113762) reported that although vegetation cover was increasing, resilience against external disturbances (drought, heatwaves, wildfires) has simultaneously declined. They use the lag-1 autocorrelation coefficient as the measure of resilience based on Critical Slowing Down theory. The results are suggestive but very noisy and require a lot of assumptions to equate to a loss of ecosystem resilience. Since the authors also show that vegetation cover is increasing at the same time the results don't appear strong enough to merit any change in our discussion.
2	7	2.1.3, para. 2	Cheng did NOT report "increased plant growth"; they reported increased GPP. The distinction is fundamentally important, has been recognized for decades, and is completely ignored in this chapter. Cheng et al. did refer to an increase in Net Primary Production as well, but you are correct they focused on Gross Primary Production. Sentence rephrased "Similarly, Cheng <i>et al.</i> (2017) noted that increased Gross Primary Production from 1982 to 2011 due to rising..." and GPP be added to the Glossary. More generally since GPP and NPP are closely correlated the use of "plant growth" is suitable.
2	6-7	2.1.3	This material is repeated in chapter 9 where it belongs. Here, it would be more appropriate to focus on how eCO2 interacts with drought on ecosystem response (e.g., 10.3390/atmos12020212) We tried to avoid repetition but there is some. We discuss drought in Ch 8: since we don't see global and US trends, the issue of declining CO2 fertilization during droughts isn't a key issue at this point.
3	19	3.2.2, last para.	Regarding the uncertainty in the land sink, a primary reason for this uncertainty is that the primary response of photosynthesis to CO2 does not predict C sequestration because of strong interactions between CO2 and climate, nutrients, stand dynamics, and other factors. That is why the almost complete focus in this report on crop plants and plant responses in greenhouses does not inform us about "CO2 uptake by land processes" We aren't making any strong claims about the land sink, we only report the results in the Global Carbon Project. Not sure if the reviewer is challenging them or not.

9	104	all	This chapter is silent on agricultural effects on atmosphere and climate. Sokal and Kachel 2025 (10.3390/en18092272) conclude: "The current study demonstrated that agricultural activities significantly contribute to the emissions of three main greenhouse gases: carbon dioxide, nitrous oxide, and methane." Emissions from the Ag sector are included in the IAM results discussed in Ch 11.
9	105	9.2, para. 2	The section title is "Field studies..." but the next three paragraphs are primarily about responses of potted plants in growth chambers or greenhouses (with exception of Blandino, which was a field study and showed a much smaller response than the pot studies). There is an important reason that the field data cited in Blandino and in SoyFACE show a smaller response than data from the potted plants under artificial conditions. These data are barely relevant to the topic you are trying to address. FACE plot studies are field studies, and we also discuss other field studies. However we also include some lab experiments. <u>Heading changed to "Field and laboratory studies of CO2 enrichment."</u>
9	105	9.2, para. 3, 4, 5	CO2Science.org website is a highly biased and unreliable website. They report on papers, or specific sentences in papers, that support their view and ignore conflicting reports or qualifying sentences. If there was another site that gathered that much data, we'd cite it. We'd need some evidence of actual bias to disqualify the CO2Science.org archive given the extent of its coverage.
9	105	9.2, para. 3	This is a report for the US. Why are you citing soybean studies in China when there is a major soyFACE study in Illinois? Yield in SoyFACE increased in eCO2 but declined with increasing temperature (10.1093/jxb/erac503). eCO2 did not result in water savings as hypothesized but rather increased soil moisture depletion. (10.1098/rstb.2024.0230) The Chinese study is on point regarding CO2 enrichment. The first study referenced by the reviewer (10.1093/jxb/erac503) only subjected soybean to elevated temperature without varying CO2, so it isn't relevant to our discussion. The second reference is to a general literature survey which doesn't appear to say anything different from what our chapter says.
9	106	9.2, para. 2	Ainsworth et al, 2025 (10.1093/jxb/erac503) state: "Early season stimulation in biomass at elevated [CO2] more than offset lower stomatal conductance in crops, resulting in greater depletion of soil moisture, instead of water savings [30,31]. Wheat tiller survival and grain filling was also reduced by elevated [CO2] under dry conditions [32]. The CO2 fertilization effect was also significantly reduced by growth at elevated temperatures in FACE experiments, again suggesting that high atmospheric [CO2] may not offset the negative impacts of global warming [29]. Thus, it may be that, to date, elevated [CO2] and the resultant climate changes have had net positive effects on agroecosystem productivity, but as climate change intensifies, there will be a shift towards net negative effects as has been suggested for natural ecosystems [3]." Our summary statement on the Ainsworth review is accurate regarding the CO2 effect. They raise the question of compound effects from simultaneous changes in CO2 and temperature. That topic is taken up in the discussion of the NBER study and Section 9.3

9	107	1st para.	Another study that should be cited is Hultgren et al, 2025 (10.1038/s41586-025-09085-w). "For all crops except rice, we estimate that warming will likely reduce global yields by 2050 (probability of loss ranges from 0.701 (sorghum) to 0.946 (wheat)... " "We estimate that global production declines 5.5×10^{14} kcal annually per 1 °C global mean surface temperature (GMST) rise (120 kcal per person per day or 4.4% of recommended consumption per 1 °C; $P < 0.001$). We project that adaptation and income growth alleviate 23% of global losses in 2050 and 34% at the end of the century (6% and 12%, respectively; moderate-emissions scenario), but substantial residual losses remain for all staples except rice." Regions with moderate average temperatures tend to suffer the largest yield losses. "Adjusting for CO2 fertilization does not qualitatively alter the structure of our findings ... but it does reduce the central estimate for end-of-century yield losses by 5.0– 9.5 percentage points... and increases the likelihood of positive aggregate effects." The Hultgren study came out after our draft had been complete. The headline results which generated massive publicity were based on RCP8.5 with no CO2 fertilization. One of our other reviewers wondered why we focused so much on the deficiencies of RCP8.5 when everyone knows it's a marginal case – this study is a good illustration of why. See Figure 3 in Hultgren.
9	108	1st	Reference to Ziska paper greatly mischaracterizes it. Ziska clearly indicates an effect of eCO2 on nutritional quality, but he indicates there is uncertainty in some of the mechanisms behind that response, including the simple dilution hypothesis. He states up front: "However, it is the direct effect of rising [CO2] on plant chemistry and stoichiometry that represents a continuing threat to the nutritional integrity of both human and animal systems." Ziska doesn't dismiss CO2, but he points out that nutrient dilution has also been observed under historical conditions in which CO2 was likely not the driver. Sentence rephrased "as is the evidence that nutrient dilution observed to date is entirely attributable to higher CO₂"
9	108	9.4, para. 1	Evidence for nutritional decline under eCO2 is widespread: Toreti et al, 2020 10.1038/s43016-020-00195-4) "A meta-analysis of 228 pairs of experimental observations on barley, potato, rice and wheat reported reductions in protein concentrations ranging on average from –15.3% to –9.8% under eCO2, while the reduction was relatively small (–1.4%) in soybean." AND Ainsworth et al 2025: "The positive 'CO2 fertilization' effect on crop yield is complicated by a decrease in many nutrients in elevated [CO2]. An analysis of 130 varieties of plants found that elevated [CO2] decreased the concentration of 25 important minerals by 8% on average, and the carbohydrate to mineral ratio was increased in these plants." We don't dispute any of this; it corresponds with what we say.
9	109		URL for Taylor and Schlenker paper is incorrect. It should be https://www.nber.org/papers/w29320. "papers" not "paper. Was this report peer reviewed? I cannot find it in a peer-reviewed journal. Thanks for the correction. We don't think it has appeared in print anywhere other than the NBER series.

12	129	This chapter is highly distressing, but I suppose it encapsulates the whole thesis of the document. Apparently, there is no point in policies to reduce emissions (or make the necessary changes in energy policy to accomplish emission reductions) because it will make no difference to the atmospheric CO2 concentration or climate. So why bother? Would you have said this in 1970 (CO2= 326), 1990 (CO2 = 354 ppm), or 2010 (CO2=390)? Probably so. And in 30 years when CO2 is 500 ppm, will it be fair to look back and evaluate your apparent call for inaction in the statement here "And even if global emissions were to stop tomorrow, it would take decades or centuries to see a meaningful reduction in the global CO2 concentration and hence human influences on the climate." But I suppose this attitude is justified if there is no adverse consequence and the only important effect of rising CO2 is to make little plants in greenhouse grow bigger (e.g., Fig. 2.3), and indirect effects on heat stress, drought, fires, sea level, etc. aren't worth discussing. The chapter rehearses some straightforward quantitative aspects of mitigation without making any policy recommendations. The reviewer is calling attention to actual problems finding mitigation strategies with positive net benefits.
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Ch	Page	para	Comment or Suggested Edit
1	2	full text	This chapter points out that the primary concern around human emissions of CO2 is that it changes the radiative balance of the atmosphere. The chapter also makes the points that CO2 has no toxicological effects on humans at current atmospheric levels, and that CO2 is necessary for photosynthesis, with the potential to stimulate plant growth at higher concentrations. These points are well-established scientific facts. Yes and experts know them but non-experts aren't necessarily aware of them.
2	3	3	It would be more reflective of the literature to say here that "Many studies over the past decade have confirmed a global greening pattern (increase in LAI) attributable to rising CO2 levels, changes in climate, changes in nitrogen deposition, land cover change, and other factors." We have added "in part" to sentence.
2	3	3	While the Zhu et al. 2016 study did find that 70.1% (+/- 29.4%) of the integrated global change in LAI was attributable to changes in CO2, most of the observed change in LAI is concentrated in the tropical forest regions of South America, Africa, and Indonesia, as shown in this report's Figure 2.1, reproduced from Zhu et al. In terms of the fraction of global land area influenced most by the factors considered in Zhu et al. 2016, effects on LAI from changing climate is the dominant factor (positive effects for 28.4% of land area plus negative effects on 4.7%, for a total area with dominant climate influence of 33.1%), followed by other factors not represented explicitly in the study or in the models (positive effects on LAI from other factors over 25.0% of land area plus negative effects over 5.3%, for a total area with other factors as the dominant effect of 30.3%), and then CO2 effects (23.2% of land area dominated by positive effects and 0.1% with negative effects, for a total of 23.4%). Since the report is focused on the U.S. it would be helpful to indicate the global context for the numbers reported. We have added new text "Other contributors included land-use changes, warming and nitrogen. The fraction attributable to CO2 was largest in the tropics; other factors played more dominant roles in CONUS."
2	3	3	The dominant factors related to changes in LAI over the U.S. (including Alaska) are land cover change (+LCC), climate effects (+CLI), other factors (+OF and -OF), and then CO2 (+CO2). There are more extensive regions where +CO2 is the dominant factor for the boreal forest zone in Canada. Given that, and given the explicit focus of the report on the U.S., it would be useful to call out in this section that the global greening pattern has distinct geographic variation in driving factors, and that over the target geography of the U.S. it seems to be dominated by factors other than increasing CO2. See my powerpoint slide 1 for a zoom on the area of interest from the Zhu et al. 2016 paper. Addressed with new sentence: CO2 fertilization effects are influenced by local temperature and nutrient and water availability, all of which vary regionally.
2	3	4	"Zheng et al. (2017) confirmed the pattern..." should be modified to say "Zhen et al. (2017) confirmed the pattern of observed greening..." As written, and in the context of the previous paragraph, the current text suggests that Zheng et al. 2017 confirmed the pattern of greening being related mainly to increased CO2, a factor which was not examined in their study. Changed: confirmed the pattern of greening, noting that over thirty years it had added 8 percent...

2	3	4	Without the addition of the appropriate context in the preceeding paragraph (my notes 3, 4, and 5) the remainder of this paragraph could be misinterpreted to mean that the impacts of greening on air temperature are attributable back to a positive effect of CO2 on greening. Rewording has addressed this.
2	3	4	The sentence "Greening has been observed globally but Chen et al. (2019) noted that China and India were exploiting it through land management changes" is misleading. Chen et al. (2019) shows that China and India are <i>causing</i> the observed greening in large areas by intentionally increasing the land area occupied by forests (China) and increases in harvested area in croplands, mainly due to multi-cropping, heavy fertilizer use, and expanded irrigation (China and India). It would be more accurate to say "Greening has been observed globally, but Chen et al. (2019) represent a disproportionate fraction of the total greening trend, accomplished through intentional increases in forest area (China), and expansion of multi-cropping, fertilizer use, and irrigation in croplands (China and India)." Changed: "Greening has been observed globally. Chen et al. (2019) show that in China and India much of it is driven by land management changes"
2	3	3 and 4	Given the changes suggested in these two paragraphs, it raises the question of whether the section title (CO2 and global greening) is itself misleading. That title wrongly suggests that all the content to follow is reflective of a direct influence of CO2 on the observed global greening trends, when the literature presents a much more <i>nuanced</i> interpretation. Title changed to CO2 as a contributor to global greening
2	3	3 and 4	It would be worth noting in this section that the multiple remote sensing-based datasets for LAI changes have remarkable differences, especially when comparing the figure 2.1 reproduced from Zhu et al. 2016 with the MODIS-based data record from Chen et al. 2019 (their figure 1). That means it is difficult to place a lot of confidence in the attribution of changes in different regions to different factors. See my powerpoint slide 2 for a comparison of the four datasets used in Zhu et al. 2016 and Chen et al. 2019. Thank you for this information. It is an interesting point but gets into more specialized detail than is necessary for this report.
2	3	5	The authorship for the Haverd et al. 2020 citation is not correct in the References section for this chapter. The correct citation is: Haverd, V., B. Smith, J. G. Canadell, M. Cuntz, S. Mikaloff-Fletcher, G. Farquhar, W. Woodgate, P. R. Briggs and C. M. Trudinger 2020. Higher than expected CO2 fertilization inferred from leaf to global observations. Global Change Biology 26(4): 2390-2402 DOI: https://doi.org/10.1111/gcb.14950 . Corrected
2	3	5	A more recent and more comprehensive study (Keenan et al. 2023) reexamined multiple data constraints and concluded that the model used in Haverd et al. 2020 (CABLE) is outside the likely range of CO2 fertilization effects, with higher CO2 fertilization than indicated by multiple independent constraints. At the very least this more recent paper should be cited in the report, with text indicating that the central estimate from the TRENDY models is more likely to be in the range of observational constraints than is the CABLE result. As it stands the report suggests that the latest science indicates that most models have underestimated the fertilization effect, and the literature doesn't currently support that conclusion. See: Keenan, T. F., X. Luo, B. D. Stocker, M. G. De Kauwe, B. E. Medlyn, I. C. Prentice, N. G. Smith, C. Terrer, H. Wang, Y. Zhang and S. Zhou 2023. A constraint on historic growth in global photosynthesis due to rising CO2. Nature Climate Change 13(12): 1376-1381 DOI: 10.1038/s41558-023-01867-2. Added sentence: However Keenan et al (2023) estimated a lower fertilization rate more in line with models.

2	4	1	The attribution analysis in the Chen et al. 2024 paper is very sensitive to the choice of multiple regression vs. partial correlation (their figures 3 vs S7, respectively), and in both cases they seem to misattribute the significant increases in LAI in India and China to CO2 rather than to changes in landcover and cropping practices. This kind of regression-based attribution is less informative than the model-based inference used for example by Zhu et al. 2016. The description of sensor calibration issues in this paper is also very cursory. It would probably be better to refer to the review paper of Piao et al. 2020 to support the claim of continued greening. Piao, S., X. Wang, T. Park, C. Chen, X. Lian, Y. He, J. W. Bjerke, A. Chen, P. Ciais, H. Tømmervik, R. R. Nemani and R. B. Myneni 2020. Characteristics, drivers and feedbacks of global greening. Nature Reviews Earth & Environment 1(1): 14-27 DOI: 10.1038/s43017-019-0001-x. Thank you for the comment. We have taken out the details about the Chen et al. analysis and say simply “Piao et al. (2020) and Chen et al. (2024) report that the greening trend continues with no evidence of slowdown, and CO2 fertilization remains the dominant driver”
2	4	2	The section 2.1.2 (Photosynthesis and CO2 levels) lacks coherence. It seems to be a collection of uncontroversial points about the ability of increased CO2 concentration to stimulate plant growth and reduce water loss through stomates. Figure 2.2 seems intended to show that the current levels of CO2 are not high compared to levels experienced in Earth's deep geologic past. A balanced treatment of the topic might call out the rate of change in CO2 concentration from human-caused emissions, and how both that rate and the absolute levels diverge radically from rates of change and ranges of variability over the past hundreds, thousands, and hundreds of thousands of years. See my powerpoint slide 3 for an example set of figures that might be included. In response to another reviewer, we have added the sentence “While the modern rate of change in CO2 is likely high compared to all prior intervals, the geological evidence is that plants and animals evolved under much higher CO2 levels than at present.”
2	7	4	The report suggests that the topics of CO2 fertilization and increased water use efficiency are not adequately treated in recent IPCC reports. In IPCC's AR6 WG I report there is an entire chapter devoted to an assessment of carbon cycle processes (Chapter 5, Global Carbon and Other Biogeochemical Cycles and Feedbacks). This is precisely where one would expect to find information about CO2 fertilization and water use efficiency. In the Executive Summary for the chapter is the following bolded headline: Increases in atmospheric CO2 lead to increases in land carbon storage through CO2 fertilization of photosynthesis and increased water use efficiency (high confidence). The associated Executive Summary text includes reference to two figures, three chapter sections, and a cross-chapter box all dealing directly with this topic. The Executive Summary text also references the important topic of nutrient dynamics and their interactions with fertilization and ecosystem-climate feedbacks, a critical nuance of the interaction of CO2 and vegetation productivity that is ignored in the report reviewed here. We acknowledge that the topic is addressed in the body of IPCC reports. But we draw attention to its omission from summary documents.

2	8	2	Section 2.2.2 (Coral reef changes) has a strong focus on past examples of early investigations that are later updated. There is also a note about the difficulty of publishing negative results, with a quote that this pattern "is true across all of science". Given the objective of this report, I suggest a shift in tone away from complaints about the kinds of papers that do and don't receive media attention, and instead highlight the latest synthesis of results about the likely future of coral reefs. A relatively recent synthesis paper (Cornwall et al. 2021) in a well-respected journal (PNAS) based on collated data from 233 locations worldwide projects that 37% of reefs will stop accreting and thus fail to keep up with sea level rise by 2050 under the low emissions RCP2.6 scenario, and no reefs would be able to accrete at a rate to stay ahead of sea level rise by 2100 under either RCP4.5 or RCP8.5. This analysis finds that most of the loss of net accretion rate is due to bleaching events, and a minority of the impacts are due to "direct physiological impacts of ocean warming and acidification on calcification or bioerosion". C.E. Cornwall, S. Comeau, N.A. Kornder, C.T. Perry, R. van Hooidek, T.M. DeCarlo, M.S. Pratchett, K.D. Anderson, N. Browne, R. Carpenter, G. Diaz-Pulido, J.P. D'Olivo, S.S. Doo, J. Figueiredo, S.A.V. Fortunato, E. Kennedy, C.A. Lantz, M.T. McCulloch, M. González-Rivero, [...] & R.J. Lowe, Global declines in coral reef calcium carbonate production under ocean acidification and warming, Proc. Natl. Acad. Sci. U.S.A. 118 (21) e2015265118, https://doi.org/10.1073/pnas.2015265118 (2021). This is a model projection study whereas for the very limited purpose of this section we are focusing on current and historical observations.
3	14	1	The study by Connolly et al. 2021 uses a linear regression approach to estimate the amount of variability in surface temperature trends that could be explained by total solar irradiance time series. Their approach is to first model the temperature trend with TSI as the dependent variable, and then compare the residuals from that fit to anthropogenic forcing factors. This is an obviously biased approach, and in fact a full paper was published the following year (in the same journal) laying out the erroneous methods and the faulty conclusions they produce (Richardson and Benestad 2022). Richardson, M. T. and R. E. Benestad 2022. Erroneous use of Statistics behind Claims of a Major Solar Role in Recent Warming. Research in Astronomy and Astrophysics 22(12): 125008 DOI: 10.1088/1674-4527/ac981c. While we agree with R&B that a partial regression is biased unless the regressors are orthogonal, Connolly et al. replied in 2023 at https://iopscience.iop.org/article/10.1088/1674-4527/acf18e in which they used updated AR6 data and reproduced their main result using multiple regression. However they also emphasized that it is only one of many possible results depending on choice of solar proxy and surface T record.
3	18	1	Section 3.2.2 (The carbon cycle relating emissions and concentrations). There is no new information or analysis presented in the chapter, and it relies heavily on Global Carbon Project information. Figure 3.2.3 is described as showing a seven-fold difference in the recent trend in land carbon sink estimates across land models, and this is given as a potential driver of uncertainty in future carbon cycle and climate change predictions. Variation among models is well known and is one of the reasons exercises like CMIP and GCP rely on multi-model ensembles when assessing the state of the science. The distribution of results looks fairly typical in this diagram, with a strong central value around 1.3 to 1.3. We're not claiming to have added new information, just reviewing what's out there.

12	129	3	The following sentence is misleading: "And even if global emissions were to stop tomorrow, it would take decades or centuries to see a meaningful reduction in the global CO2 concentration and hence human influences on the climate." It is true that bringing global emissions immediately to zero would not reduce CO2 concentrations on short timescales. It is not true that this same scenario means no reduction in human influence on the climate. We must compare the zero emissions scenario to something, and the most meaningful comparison is the current trajectory of increasing emissions and the resulting super-linear increase in concentration. So by reducing emissions to zero we clearly avoid the expected increases in concentration and the expected increases in radiative forcing together with increased near surface air temperature and all the other expected consequences. So our change in action - going to zero emissions - does in fact have an immediate and growing human influence on the trajectory of the climate system. That is not an argument for reducing our emissions to zero tomorrow, it is just an argument for logic and clarity in how we talk about consequences of different actions. The sentence in the text is correct. It's also true to say that going to zero emissions would, over time, open up a widening gap between observed and counterfactual. But realistically we are only looking at marginal changes. The stock-flow mismatch is one reason IAMs have not recommended going to zero emissions.
12	129	5	Regarding the sentence "The practice of referring to unilateral U.S. reductions as "combatting climate change" or "taking action on climate" therefore reflects a profound misunderstanding of the scale of the issue." This makes the dubious assumption that when people refer to "combating climate change" or "taking action on climate" they are ignorant of the scale of the problem. Instead, it is probably more justifiable to assume that it is well-understood by most people who advocate for these local and national changes that the major emitters must act together to make a big difference in global emissions. It is at least worth considering, in the context of this report, that a path toward action at the necessary scale will require local and national action from a broad consortium, and that individual advocacy is a useful and necessary starting point for shifting the inertia of global policies. Sentence modified to read "The practice of referring to unilateral U.S. reductions as "combatting climate change" or "taking action on climate" on the assumption we can stop climate change therefore reflects a profound misunderstanding"

REVIEWER #6

ch	pg	para	Comment or Suggested Edit
Overarching	Overarching	Overarching	• I would like to thank the authors for the opportunity to provide comment on this report. Providing decision-makers with information about the impacts of carbon dioxide emissions on the U.S. climate is critical as they face consequential decisions about the future of energy, agricultural, and environmental policy. Assessments of the science such as IPCC reports and the NCA benefit from undergoing robust review including expert review, public review, and government review with review comments and responses made publicly available. Similarly, important government reports and regulations undergo inter-agency review and are published in the Federal Register for a full notice and comment process and publish a public response to comment. While these processes are far from perfect, they offer the opportunity for improvement and help lend authority to the final products, and I highly encourage you to undertake a similar robust and open peer review process for this report to enhance the report’s credibility in the eyes of decision-makers and the public.
Executive Summary	viii	1	• There is a disconnect between the stated intent of the report by the authors in the preface, “whether carbon dioxide emissions endanger the U.S. public,” and this executive summary, as well as the organization of the report. Would suggest aligning by either reframing the focus in the preface to better match the organization of the report, or better aligning the report organization with the stated focus. Preface has been reworded and the statement eliminated. We have also changed the title to clarify this
Preface	ix	3	• “While the report is intended to be accessible to non-experts, we have omitted some introductory or explanatory material that can easily be accessed elsewhere. Nor have we attempted to survey entire literatures related to the topics covered.” • While this approach is understandable given the time constraints this report was produced under, given the level of visibility this report will have, it potentially opens up the report to criticism of being misleading by omission – focusing on areas where the authors disagree with the broader scientific literature and omitting areas large areas that are known about climate where there is less disagreement. See our response to the previous comment and revisions to paragraph 2.
Preface	ix	3	• “We have focused as much as possible on literature published since 2020 and referenced previous IPCC and NCA assessment reports. We have also used data through 2024 where possible.” • This is a good approach for this report; however, much of the literature cited is from pre-2020, and many of the references to IPCC and NCA reports are to older reports (e.g. NCA 4 and IPCC AR 4&5) instead of NCA 5 and IPCC reports from the 6th assessment cycle. In these sections that heavily cite this older literature, it is not clear if the newer literature does not address these points or if the issues raised in the older literature are resolved or significantly changed in the newer literature. We have included reference to previous assessment reports where the analysis is insightful and not superseded by later reports. We note that we regard NCA4 as far more credible than NCA5

Preface	ix	3	• The IPCC’s mandate is to assess the scientific literature comprehensively, including a range of views, and report disagreements. This report has a tendency to selectively quote the IPCC focusing on disagreements and excluding areas where scientists agree. This approach risks giving a misleading picture of the state of the science through omission. A possible way to address this is to have a section summarizing areas of agreement by pointing to all statements of fact and high confidence statements from IPCC AR6 before digging into the more controversial areas with disagreement. This could be a short discussion about areas of agreement up front before explaining the focus of this report on these areas of disagreement, with the IPCC statements of fact and high confidence statements included in an appendix. • The report also includes only a very small subset of the literature since 2020. The authors should describe the approach to how they selected the literature included, and if possible, point to any systematic ways excluded literature could lead to different conclusions. • It is also notable that there a fair amount of new analysis in this report done by the authors that has not yet been peer reviewed. It would be good to flag these spots with a note about why these are needed while other related peer reviewed articles are excluded. This is addressed to some extent in the revised Preface
1	2	1	• If the goal of this report is to discuss links between CO2 and climate, this is an odd way to begin the report with a focus on differences between CO2 and criteria air pollutants. It clears up a confusion of language that persists
1	2	1	• “It is an issue of concern because of its potential effects on the global climate, a complex issue that occupies much of this report.” Suggest deleting the word potential as the existence of the effect is not disputed. Deleted: “potential”
1	2	4	• “But the primary concern about CO2 is its role as a greenhouse gas (GHG) that alters the earth’s energy balance.” Would add “warming the planet” to the end of this sentence as the qualitative effect is not debated and the concern is not about the energy balance itself but about the warming effects of the imbalance. Added: “warming the planet”
2	3	1	• “The recent decline in pH is within the range of natural variability on millennial time scales. Most ocean life evolved when the oceans were mildly acidic. Decreasing pH might adversely affect corals, although the Australian Great Barrier Reef has shown considerable growth in recent years.” • Note that the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) finds that pH decline has very likely emerged from natural variability. SROCC SPM A.2.5, “Open ocean surface pH has declined by a very likely range of 0.017–0.027 pH units per decade since the late 1980s, with the decline in surface ocean pH very likely to have already emerged from background natural variability for more than 95% of the ocean surface area.” We have left this out since it relates to attribution, which is beyond the scope of what we are addressing in this chapter
3	15	3	• “Instead, the IPCC has created various sets of scenarios meant to span a plausible range of possibilities” • Suggest changing “created” to “assessed” as the scenarios are created by the science community not the IPCC. We have changed the wording to “used”
3	16	4	• “The IEA trends, which are based on plausible extrapolations of current economic and demographic trends, run below the entire envelope of RCP projections, implying not only that RCP8.5 is dubious, but that even lower emission scenarios are unlikely.” • Burgess compares IEA to the two highest SSP-RCP scenarios, not to the full range. The last sentence of the paragraph is incorrect – the range in Burgess is only no climate policies which doesn’t include the lower RCPs. We find the labeling on the Burgess diagram unclear and hard to understand. The text has been revised and we added a reference to Pielke Jr et al 2022 which has a better presentation.

3	17	2	• “As of 2023, global CO2 emissions have been tracking well below SSP7.0 and are even below SSP2-4.5.” • Note that near-term emissions are not necessarily a good predictor of long-term emissions, as the latter will depend on changes in population, demographics, technology, and policy that do not have the same influence on near-term emissions. Noted
3	22	6	• “In summary, while there is clearly warming in the land record, there is also evidence that it is biased upward by patterns of urbanization and that these biases have not been completely removed by the data processing algorithms used to produce climate data sets.” • Quantitative info would be helpful here. How large is the warming? How large might the bias be? This is a topic that needs revisiting. The quantitative estimates are 15+ years old
4	26	1	• The Chapter Summary doesn’t really capture the full tax of the chapter. Would suggest: Defining ECS/TCS, reporting values for ECS and uncertainties/methods, then reporting values for TCS, preferably with a sentence on what those values imply The terms are defined in the chapter
4	26	2	• “This raising of the lower bound is less justified; evidence since the AR6 finds the lower bound of the likely range to be around 1.8°C.” • This isn’t really discussed comprehensively in the chapter. It is discussed, in context of Nic Lewis’ research
4	26	3	• “The climate’s response to increasing concentrations of CO2 is central to the scientific debate on anthropogenic climate change” • Suggest rewording this to, “The magnitude of the climate’s response...” As currently worded it could be a bit misleading since the qualitative effect (i.e. increasing CO2 concentrations lead to increases in global average temperature) is not disputed – the uncertainty is around the magnitude of the effect. Reworded
4	26	6	• The text sites Dayaratna (2016), but this should be a reference to Dayaratna (2017) as listed in the reference section. Fixed
4	26	6	• “If ECS is very high (above 4.5°C) immediate aggressive emission controls become more imperative, whereas no CO2 emission controls are economically justifiable for ECS below 2.0°C (Dayaratna et al. 2016, 2020).” • This could use additional clarification as there are low and now carbon technologies that can be economically justified based on cost of energy alone, depending on technology, location, etc. In the absence of specific source citations we have left the text as is. We are not aware of new low or no carbon technologies that are affordable and scalable. Likewise, if energy conservation pays for the low carbon tech people would have been adopting them already.

4	26	6	• “Obtaining a precise estimate is impossible, so policy making needs to account for the uncertainty.” • The Social Cost of CO2 (SC-CO2) as used by the USG in regulatory impact analyses has always accounted for uncertainties in the ECS. EPA (2016) used a probability distribution for the ECS calibrated to IPCC AR4 findings (the most recent values available at the time) to harmonize the approach for the three models used (FUND, DICE, and PAGE). EPA (2023) updated the SC-CO2 in response to NAS recommendations (NAS 2017) to include a much fuller representation of the uncertainties in both ECS and TCR, and utilized a modular approach incorporating the Finite amplitude Impulse Response (FaIR) climate model, a reduced complexity climate model, with ECS and TCR distributions calibrated to IPCC AR6 to represent this uncertainty. • The Dayaratna (2017 & 2020) papers referenced here analyze sensitivity of a subset of the older models used in EPA (2016) to just ECS estimates. It would be helpful to address the advances in the broader literature that are discussed and represented in EPA (2023) as the focus of this report is on literature published since 2020. • EPA (2016) “Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 Interagency Working Group on Social Cost of Greenhouse Gases, United States Government.” https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf • NAS (2017) “Valuing Climate Damages. Updating Estimation of the Social Cost of Carbon Dioxide” https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of Most of the topics are touched upon in Ch 11. The newer EPA approach (e.g. the FaIR model) don’t reflect a fundamentally different approach than before. Will discuss below.
4	28	2	• “Because of concerns about model tuning and the high sensitivity to cloud parameterizations, the IPCC AR6 (2021) did not rely on climate model simulations in their assessment of climate sensitivity, relying instead on data-driven methods.” • AR6 WGI 7.5.5 states this a little differently. IPCC’s assessment wasn’t “directly informed” but “ESMs remain essential tools.” Our statement is ok as is
4	29	3	• “For AR6, the IPCC placed primary weight on the results of Sherwood et al. (2020)...” • The IPCC assessed a large number of studies, not just Sherwood (2020). Our statement is ok as is. Sherwood et al was predominantly relied upon
5	32	1	• It would be helpful for the reader for this chapter to start with a summary figure (e.g. like IPCC AR6 WG1 – SPM.1 or Fig. 3.4). Currently, the chapter jumps right into details that will be difficult for anyone who is not a climate scientist or already versed in these issues to understand or interpret. Too late in the process to add a new figure
5	33	Figure	• “Figure 5.1 CMIP6 Average surface temperature range across 33 models and standard deviation using SSP5-85 scenario.” • SSP5-85 is an excessively high scenario that is not representative of current expectations of emissions projections. Suggest changing the figure for on with data from a less misleading and more representative scenario. The use of RCP8.5 doesnt make much difference given high spread for historical period, but we agree this should be changed for a subsequent version of the Report

5	34	1	• There have been extensive published comments and responses on the approach used in Scafetta (2023). Can these be reflected here? • G.A. Schmidt, G.S. Jones, and J.J. Kennedy, "Comment on "Advanced Testing of Low, Medium, and High ECS CMIP6 GCM Simulations Versus ERA5-T2m" by N. Scafetta (2022)", Geophysical Research Letters, vol. 50, 2023. http://dx.doi.org/10.1029/2022GL102530 • N. Scafetta, "Reply to "Comment on 'Advanced Testing of Low, Medium, and High ECS CMIP6 GCM Simulations Versus ERA5-T2m' by N. Scafetta (2022)" by Schmidt et al. (2023)", Geophysical Research Letters, vol. 50, 2023. http://dx.doi.org/10.1029/2023GL104960 • Z. Hausfather, K. Marvel, G.A. Schmidt, J.W. Nielsen-Gammon, and M. Zelinka, "Climate simulations: recognize the 'hot model' problem", Nature, vol. 605, pp. 26-29, 2022. http://dx.doi.org/10.1038/d41586-022-01192-2 • S. Jain, A.A. Scaife, T.G. Shepherd, C. Deser, N. Dunstone, G.A. Schmidt, K.E. Trenberth, and T. Turkington, "Importance of internal variability for climate model assessment", npj Climate and Atmospheric Science, vol. 6, 2023. http://dx.doi.org/10.1038/s41612-023-00389-0 The Schmidt et al paper is a comment on a different paper of Scafetta's and focuses on his t-statistic, which isn't pertinent to the paper we cite (from Climate Dynamics). Regarding the Jain et al paper, Scafetta uses ensemble ranges within each ECS type and doesn't simply rule models out but shows that some perform well for TAS. Relevance of the Hausfather et al paper is not clear.
5	34	4	• "Spencer (2024) has also provided a useful summary of the Model-Observation mismatch by comparing trends in surface temperature data products with those in individual climate models, as summarized in Figure 5.3; most climate models show substantially more warming than the observations since 1979." • It is worth noting that IPCC projected temperatures do not use all models and instead focus on those that best reproduce observations. So while some models may show warmer or cooler temperatures than observations, that does not imply that projections from large assessments reflect those biases. Our text speaks to the collection of CMIP6 climate models; some of those with the largest amount of warming are widely used models from the US and UK
5	37	3	• "Hence, we assess with medium confidence that CMIP5 and CMIP6 models continue to overestimate observed warming in the upper tropical troposphere over the 1979–2014 period by at least 0.1°C per decade," • "Notably, despite the accumulation of evidence of excess model warming the IPCC assigns only medium confidence to the existence of a warming bias." • This reflects a more general issue with IPCC confidence statements where the inclusion of a quantification reduces the confidence they include. Here the full statement with the quantification of 0.1C per decade is assigned medium confidence whereas a statement about the existence of the bias without a specific quantification would receive higher confidence. Noted
5	39	Figure 5.7	• Does this update with data through 2024 use the same models that Christy and McNider (2017) used, or does it use updated versions for the models as well? This would be helpful to clarify here and in other places where figures are produced with updated data. Excellent catch. Fig. 5.7 uses CMIP-6 models, this will be stated in the caption as an update of Christy and McNider with CMIP6 output.
5	39	3	• "The IPCC AR6 did not assess this issue." • Was this assessed in IPCC AR5? Many of the citations here could have been assessed then. Is there any more recent evidence on these issues that should be referenced here? IPCC has never addressed this issue with rigor, but does reluctantly note the discrepancy.
5	40	1	• Are there more recent papers or data available? All the info here is AR6 or pre-AR6, but more recent years have shown more surface warming. It would be interesting to show stratospheric temperatures for these more recent years as well to see how this relationship holds. Santer et al. (2023) has been added.

5	40	5	• Trends in snow cover depend on both changes in precipitation and changes in temperature. It would be helpful if these were discussed separately rather than showing the net effect for one region/season. Context for statement is that the models get it wrong
6	47	1	• This chapter relies solely on observations and does not include other lines of evidence, it would be helpful to discuss what these other lines of evidence indicate to avoid introducing potential biases (e.g. what do process based lines of evidence show?) Yes we rely primarily on observations. We have added some text regarded process-based analyses, notably in the section on hurricanes
6	47	1	• The chapter summary does not fully capture the chapter or the science. Suggest talking about the extremes affected by climate, the extremes not affected by climate, and those where the data isn't sufficient to establish a trend. We think our summary is appropriate
6	47	3	• “Over geologic time the climate system has generated an (essentially) infinite variety of weather patterns and extremes...” • Just because an event occurred before humans does not mean humans are not influencing the frequency or intensity of such events now. Additionally, if something has happened in the geologic record, but humans have never experienced it before, they may not be prepared for such an event. Changes in frequency or intensity are precisely the issues discussed. Adaptation to extreme weather is a separate but important issue
6	50	Figure	• The figure heading has “@RyanMaue” in the title. Looks odd to have a social media handle in the figure. Is the source peer reviewed? We have added reference to an older publication by Maue that describes the analysis
6	52	4	• Insufficient data is different than no effects. It would be helpful to be clear in instances like this whether a conclusion is because the data supports it, or because there is insufficient data to say the opposite. This is covered in the last para of the section
6	53	Table	• Could you also show a similar table with hurricane precipitation? It is hard to get historical rainfall going very far back
6	53	5	• The last two paragraphs show findings from NCA4. With the interest in focusing on recent literature, what does NCA5 say about these issues? Does it not cover this issue, does it say the same thing, does it contradict this finding? NCA5 statements are discussed in the body of the text, see pp 57ff.
6	54	1	• The heading of section 6.3.1 is a bit misleading as this is partly driven by warmer winters and fewer cold days. For the CONUS, the heading is accurate as demonstrated with observational analyses
6	58	Figure	• Figure 6.3.5 shows the number of days greater than or equal to 95F in 6-year periods. Why show this in 6-year periods? That seems like an unusual choice. Would this look different with 5, 10, or 15 year periods? The time series is 126 years long, which is evenly divisible by 6. The point is to compress the depiction of interannual (i.e. natural) variability and examine slower changes. In our decimal system, 5 or 10 years is more commonly used, but with 126 years of data, we did not want to leave an “orphan” column (one with fewer years) compared with the entire time series. This is explained in the figure caption.
6	58	4	• “We measure “Heatwave Days” here as the count of all days in May-Sep each year that exceed the 90th percentile for that day and that lie within a period of at least six consecutive days.” • Why six consecutive days? Would this look different for 5 days, a week, 10 days? Six days seems like an unusual period to pick. As noted in the text we use a metric defined in NCA4 for heat wave days. Regardless, whatever parametric choice is made (i.e. 5 days, 10 days, 85th percentile, etc.) the 1920s to early 1950s dominate the occurrence of heat wave days. Added: The pattern of results show below does not depend on the choice of reference period.)”

6	58	4	• The dependence on and subsequent choice of reference periods is worrying. Can multiple reference periods be shown to show the dependence? There will be no change in the fundamental result no matter which reference period is chosen. If the entire period-of-record is used to calculate percentiles, there will be fewer percentile exceedences than if a cold reference period is chosen (as was done in NCA4). However, the shape of the outcome will be the same.
6	59	3	• “The NCA5 directs readers to the website https://www.globalchange.gov/indicators/heat-waves (USGCRP 2023)” • Broken link. The link was live when the report was written, but the Reviewer is correct that it is now broken. Fortunately, we included the figure from that link to demonstrate the unusual start date (1961) and the fact that the sample contained only large cities.
6	61	3 to 6	• This reads as a very selective analysis. With a very tight time constraint and the fact our analysis required the construction of serially complete datasets, we selected regions that were called out by NCA5 and/or the IPCC AR6 as unusual. In future versions we will have data for more regions (e.g. upper Midwest, Central Plains, Texas Hill Country).
6	67	2	• Is this section suggesting that climate change is causing the decrease in tornadoes? No, this section doesn’t engage in attribution
6	68	7	• This is another place where it would be better to reference newer literature and NCA5 instead of relying on NCA4. What has changed since then? NCA5 mentions drought many times, but in anecdotal ways without metrics for testing. For example, NCA5 pg 1-23 states. <i>“Between 1980 and 2022, drought and related heatwaves caused approximately \$328 Billion in damages (in 2022 dollars). Recent droughts have strained surface water and groundwater supplies, reduced agricultural productivity, and lowered water levels in major reservoirs, threatening hydropower generation.”</i> This statement simply says that the demand for water was not met by the human-built systems which manage water supplies – there is no metric here that measures a change in the natural water supply. The statements on which we focus relate to whether the supply has been changing – a metric related to the climate system.
6	69	1	• Figure 6.7.1, is this the same indicator used in AR6? We have clarified the text to refer to meteorological drought. AR6 speaks mostly of “Agricultural and Ecological Droughts” which are defined in for various regions as <i>“Agricultural and ecological droughts are assessed based on observed and simulated changes in total column soil moisture, complemented by evidence on changes in surface soil moisture, water balance (precipitation minus evapotranspiration) and indices driven by precipitation and atmospheric evaporative demand”</i>, so we are unsure what specific metric is referenced.” Elsewhere it simply uses the term “drought” or “Meteorological and Hydrological Drought.” AR6 pg 1075 “A drought is a period of abnormally dry weather that persists for long enough to cause a serious hydrological imbalance (Glossary; Wilhite and Glantz, 1985; Wilhite, 2000; Cook et al., 2018). Most droughts begin as persistent precipitation deficits (‘meteorological drought’) that propagate over time into deficits in soil moisture, streamflow, and water storage (Figure 8.6), leading to a reduction in water supply (‘hydrological drought’). Increased atmospheric evaporative demand increases plant water stress, leading to ‘agricultural and ecological drought’. The best we can say is the AR6 used a different metric than shown in Fig. 6.7.1 that likely varied from region to region. However, Fig. 6.7.1 has high correspondence with drought-related impacts.

6	69	3	• “In summary there is no evidence of increasing drought frequency or intensity in the U.S. or globally over recent decades.” • This statement is not supported by the citations presented here. AR6 finds that there are trends in agricultural and ecological droughts and this section does not contradict that finding, so this general statement about there being no evidence of increasing drought frequency or intensity is misleading. • AR6 SPM A.3.2 – “Human-induced climate change has contributed to increases in agricultural and ecological droughts in some regions due to increased land evapotranspiration (medium confidence).” Footnote, “Agricultural and ecological drought (depending on the affected biome): a period with abnormal soil moisture deficit, which results from combined shortage of precipitation and excess evapotranspiration, and during the growing season impinges on crop production or ecosystem function in general (see Annex VII: Glossary). Observed changes in meteorological droughts (precipitation deficits) and hydrological droughts (streamflow deficits) are distinct from those in agricultural and ecological droughts and are addressed in the underlying AR6 material (Chapter 11).” We have added “meteorological” to last sentence
6	69	4	• “The IPCC has not provided an assessment of wildfires.” • AR6 WGII SPM discusses wildfire, and WG1 SPM discusses fire weather. • AR6 WGII SPM – B.1.1, B.1.4, Fig. SPM.2, Fig. SPM.3, B.5.2, B.6.2, C.2.3, C.4.2, D.4.2, • AR6 WGI SPM – C.2.4 Restated: The IPCC has not provided an attribution analysis of wildfires
7	75	1	• “The largest sea level increases along U.S. coasts are Galveston, New Orleans, and the Chesapeake Bay regions” • How much? Are there quantifications? The figures show this
8	83	3	• “AR5 Working Group II (Cramer et al., 2014) makes the following statement:” • What does AR6 say on this topic? The science on attribution has evolved since AR5. The AR6 did not make an analogous statement, but the challenges haven’t been resolved
8	84	6	• “There are three areas of substantive criticism of the IPCC’s assessment of the causes of the recent warming...” • Are there citations that can be included here or are these criticisms attributed to the authors? The section describes this adequately
8	84	6	• “IPCC’s policy-informing...” • This phrasing is a bit odd. IPCC reports are policy relevant but policy neutral. This phrasing the direct policy in some way. Deleted policy-informing
8	90	3	• “For comparison, the IPCC estimate of forcing from the increase in atmospheric CO2 compared to preindustrial times is approximately 2.2 W/m2 (Figure 3.1.2).” • This is comparing different time periods. Figure 8.2 includes data for 2023 and 2024, IPCC wouldn’t include the most recent years since it was published in 2021. Suggest updating from the IPCC data to Forster et al. (2024) that updates these indicators. • Forster et al. (2024) “Indicators of Global Climate Change 2024: annual update of key indicators of the state of the climate system and human influence” https://doi.org/10.5194/essd-17-2641-2025 Updated
8	92	2	• “It is not easy to justify a new positive low cloud feedback that began emerging in 2015.” • Explain why this is not easy? Added, “since there is no obvious feedback trigger starting in 2015”

8	93	4	• “Other columns of IPCC Table 12.12 report on whether anthropogenic signals are expected to emerge this century under RCP8.5, the most extreme forcing scenario. We have omitted these columns for several reasons.” • Can this be done for RCPs other than 8.5? The point of these omitted columns in IPCC Table 12.12 was to show that for some extremes we may not see an effect now, but will in the future. As it is presented here it implies future changes won’t matter. Agree 4.5 would have been better, but this is a query that should be directed to the IPCC
9	104	1	• IPCC AR6 WGII has an assessment of agriculture (both in the SPM and in Chapter 5), and the IPCC also has a special report on Climate Change and Land, that are more comprehensive, recent, and cover a larger range of the literature than discussed here. Please update this chapter to reflect these findings. Need a more specific point of challenge. Other reviewers have brought up specific topics that were either addressed by revisions or are already covered. We think this is one area that goes under the heading of critiquing the mainstream, based on peer-reviewed literature.
10	110	4	• Section 10.1 rightly points out that technological advances have substantially reduced losses from extreme weather events. We are better at forecasting, preparing for, and adapting to extreme weather than we were in the past, and these advances all help reduce impacts. However, our ability to do this in the future depends upon preparing for future changes – we can’t simply assume adaptation will continue, we need to provide information on future risks and how those risks are impacted by climate change in order to inform continued technological advances and future adaptation. Noted
10	111	1	• “In May 2025 NOAA announced it has withdrawn the Billion Dollar Disaster product from publication (Pielke Jr., 2025).” • It would be better to cite an official government source from NOAA announcing this withdraw instead of a blog post commenting on it. Agreed, but this is the best information available from a well-published expert
10	111	2	• Losses from extreme weather and climate events are driven by climate risk (the physical events themselves), exposure to those risks (population and infrastructure impacted by these events), and adaptation to those events (technological advances in forecasting, warning systems, and resiliency). Understanding these risks requires disentangling these drivers in order to prepare for the future. Noted. Such a risk assessment is beyond the scope of this report
10	112	1	• There are additional citations that focus on the net effects of heat and cold related mortality that would be worth discussing and citing in this section. • EPA. 2024. Draft Technical Documentation for the Framework for Evaluating Damages and Impacts (FrEDI). U.S. Environmental Protection Agency, EPA 430-R-24-001. • Cromar et al., 2022. Global Health Impacts for Economic Models of Climate Change: A Systematic Review and Meta-Analysis. Ann. Am. Thorac. Soc. 19, 1203–1212. https://doi.org/10.1513/AnnalsATS.202110-1193OC • Hsiang et al., 2017. Estimating economic damage from climate change in the United States. Science 356, 1362–1369. • Mills et al., 2015. Climate change impacts on extreme temperature mortality in select metropolitan areas in the United States. Clim. Change 131, 83–95 The Cromar meta-analysis included only 7 studies for the US all published before 2015, and not all of them examined both hot and cold extremes. We think the citations we have, which includes the EPA, are adequate.
10	113	7	• Section 10.3.2 has good points about the importance of energy affordability and how energy poverty impacts adaptation behaviors. Cong et al. (2022) is another good citation for this section. • Cong, S., Nock, D., Qiu, Y.L. et al. Unveiling hidden energy poverty using the energy equity gap. Nat Commun 13, 2456 (2022). https://doi.org/10.1038/s41467-022-30146-5 Citation added

11	Chapter	Chapter	• Much of this chapter if focused on older literature on SCC and on applications that fall outside of how the USG has actually implemented SCC. This chapter would benefit from a more explicit focus on EPA (2023) as it represents the latest state of the literature on SCC, shows how the USG applies the SCC for regulatory impact analyses, shows how the USG updated the older IAG era SCC as represented in EPA (2016) in response to the recommendations in NAS (2017), shows how uncertainty is incorporated into SCC estimates, and discusses areas of the literature that are on the frontier, highly uncertain, and not ready to be incorporated into the official USG estimates. • As currently written much of this chapter is focused on these highly uncertain areas of the literature that are not incorporated into USG SCC estimates (e.g. tipping points, and climate change impacts on economic growth). EPA (2023) discusses these issues and why they are not ready to be incorporated into the official estimates. • Furthermore, EPA (2023) estimates of the SC-GHG does incorporate climate benefits such as CO2 fertilization and reductions in cold mortality discussed elsewhere in this report, and this should be noted and discussed. • Finally, this section ignores areas of real controversy in the calculation of SC-GHG as it is used by the USG – namely the question of global vs. domestic benefits and the treatment of discounting when valuing benefits to future generations. These controversial issues deserve far more attention in this report instead of spending so much space on issues on the fringe of the literature that are not even included in USG SC-GHG estimates. • EPA (2016) “Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 Interagency Working Group on Social Cost of Greenhouse Gases, United States Government.” https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf • NAS (2017) “Valuing Climate Damages. Updating Estimation of the Social Cost of Carbon Dioxide” https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of The new discussion by the EPA simply revisits longstanding issues. Switching to separable models like FaIR isn’t an advance, because everything still comes down to choice of influential parameters like ECS, discount rate, etc. They add some new damage components but as discussed they jumped on the M17 findings prematurely. Ch 11 focuses a lot on non-SCC topics like the relationship between temperature and growth because that’s been the focus of a lot of research. It’s not the case that this work is too new to be incorporated into SCC calculations. Moore and Diaz (cited) for example incorporated the Dell et al result into an SCC model. The problem is that the temperature signal in growth isn’t robust so economists aren’t convinced it belongs in the models. We don’t discuss the global vs local benefits issue mainly because standard SCC models have always assumed we should measure global effects and we are not offering an argument otherwise.
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11	116-120	Section 11.1	• This chapter has a heavy focus on the relation between climate change and economic growth and how this relationship factors into the SCC. There is an ongoing debate in the literature about persistence in climate damages as measured by changes in economic growth over time; however, these persistence effects on economic growth are not considered in the most recent version of the SC-GHG used by the USG – EPA (2023). This chapter generally ignores the existence of EPA (2023), it is mentioned once in passing, and does not inform readers that these controversial areas of current research are not included in government estimates of the SC-GHG. • EPA (2023) page 58 says, “Given the statistical insignificance of the estimated coefficient on the productivity indicator in the published Howard and Sterner meta-analysis, the SC-GHG estimates presented in this report do not rely on Howard and Sterner’s specifications that include productivity effects. This is consistent with the authors’ recommendations in the published paper, to only consider the inclusion of the productivity impact in sensitivity analysis. However, the question of whether the effects of climate change impacts (e.g., temperature, tropical cyclones, and other extreme weather events) on the economy are only temporary or persistent is an active area of research. Over the past decade, a host of empirical studies have found evidence of temperature changes having persistent effects on the economy (e.g., Dell et al. 2012; Burke et al. 2015; Moore and Diaz 2015; Deryugina and Hsiang 2017; Ricke et al. 2018; Burke and Tanutama 2019; Colacito et al. 2019; Henseler and Schumacher 2019; Kahn et al. 2021; Kumar and Khanna 2019; Bastien-Olvera et al. 2022); this is an important finding because even small changes in economic growth rates accumulate into large economic impacts over time.” Some are discussed in Section 11.1.2 but our review is more up to date.
11	116	1	• “Economists have long considered climate a relatively unimportant factor in economic growth, a view echoed by the IPCC itself in AR5.” • It would be good to update this to the relevant conclusions in AR6 to reflect the more recent literature. AR6 didn’t have an economics chapter comparable to AR5.
11	117	5	• This section makes an important point, much of the public does not understand that climate impacts are relative to projected future without climate change and need to be put in the context of economic growth and a future where our decedents are better off than we are today. O’Neill (2023) is a useful citation here, finding that, “Climate change research and assessments, including the most recent IPCC report, paint an increasingly dire picture of the future. However, the assumption that the future will be worse than the present may be wrong for many aspects of human well-being.” • O’Neill, B.C. Envisioning a future with climate change. Nat. Clim. Chang. 13, 874–876 (2023). https://doi.org/10.1038/s41558-023-01784-4 Citation added
11	119	3	• “Overall they could not detect a temperature effect on GDP or GDP growth, and they estimated the 95 percent confidence interval for the impact on global growth as of 2100 even under the exaggerated RCP8.5 warming scenario spans .86 percent to +388 percent. In other words the net effect is likely positive but too uncertain to distinguish from zero.” • This finding from Newell et al. (2021) needs to be contextualized with their complementary finding that models excluding growth effects and relating temperatures to GDP levels are far more certain. This is important to include since the actual USG application of SC-GHG does not include growth effects. • Newell et al. (20201) states, “Models relating temperature to GDP levels yield climate impact estimates that are far more certain. The best such models imply GDP losses by 2100 of 1–3%, consistent with damage functions currently embedded in the major integrated assessment models that underpin the U.S. social cost of carbon.” The discussion in this section is focused on the effect of dT on growth. The discussion of how dT affects the level of income is what 11.1.1 focuses on. It’s very regionally heterogenous so the small global average reported in Newell et al. isn’t very insightful.
11	119	6	• “To summarize, economists consider climate a relatively unimportant factor in economic growth, a view echoed by the IPCC itself in the Fifth Assessment Report.” • Need to update to reflect AR6 findings. See above

11	121		• “The concepts of estimation and uncertainty do not readily apply to SCC calculations.” • The discussion of uncertainty in IAMs should reflect EPA (2023) which incorporated many major advances in the treatment of uncertainty in integrated assessment modeling. See section A.8 of EPA (2023) for a summary of the quantified sources of uncertainty in the SCGHG estimates presented in EPA (2023) • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf Our point is that the key underlying parameters are uncertain, and the range of SCC estimates merely reflects those uncertainties. The fact that the EPA proposes ways to compute distributions of the SCC doesn’t affect this point, it follows from it.
11	121	3	• “Economists use IAMs to compute the SCC. Two of the best known are the Climate Framework for Uncertainty, Negotiation and Distribution (“FUND”, Tol 1997) and Nordhaus’ DICE.” • This is old literature. Given the advances since FUND and DICE were the leading SCC models, and this report’s focus on literature post-2020, this section should be updated to focus on the models used to calculate the SC-GHG in EPA (2023) which represents advances over the approach used in FUND and DICE in response to NAS (2017) recommendations. Added a mention of this. • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf
11	121	4	• “and a ‘judgmental adjustment’ of 0.5 percent for excluded impacts at 3°C warming” • EPA (2023) is the most up to date representation of the USG approach to SC-GHG incorporating the recommendations of the NAS (2017), and EPA (2023) explicitly does not included an adder for missing damages. This is another example of this chapter focusing on older less relevant literature, and it really should be comprehensively updated to address EPA (2023). Barrage and Nordhaus is a (2024) paper. We don’t endorse their approach, just describe it. But in some respects the EPA approach is already obsolete because the new Administration has abolished the SCC. • EPA (2023), page 59 states, “the model runs performed for this report do not adopt a 25% adder (as used in the DICE model (e.g., Nordhaus 2017)) to account for unknown or missing damages for the meta-analysis-based damage module.” • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. • NAS (2017) “Valuing Climate Damages. Updating Estimation of the Social Cost of Carbon Dioxide” https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of

11	122	6	• “Abatement costs: IAMs represent the cost to the economy of reducing CO2 emissions. If CO2 emission reductions are assumed to be inexpensive, then the model will conclude that the optimal policy should aim for deeper emission cuts and vice versa.” • IAMs such as DICE are often used in a mode of calculating the optimal level of abatement where they do indeed compare the SCC with the marginal cost of abatement to find the optimum. However, these abatement costs are not part of the SCC calculation, and as used by the USG for the purpose of regulatory impact analyses, this feature of these IAMs is not used. Instead the USG has other more appropriate tools for analyzing the costs of specific regulations. This distinction is important here as the assumptions about the cost of emissions abatement does not have any bearing on the calculation of the SCC. The paragraph has been rewritten to clarify this.
11	122	7	• “For example, in 2023 the U.S. Environmental Protection Agency raised its preferred SCC value about 5-fold over the estimates it had issued ten years earlier. This is not because new data had been collected or better mathematical methods had been invented, but because new assumptions had been used, and the validity of those assumptions was a separate question.” • This paragraph contains the only reference to EPA (2023). First, the characterization of this update as only because new assumptions are used is factually incorrect. EPA (2023) represents a significant change to how the USG calculated the SC-GHG moving away from the FUND/DICE/PAGE models used in the IWG era (see EPA (2016)) to a modular approach as recommended by NAS (2017). This chapter needs to address the NAS (2017) recommendations and the EPA (2023) response to those recommendations to capture how SC-GHG was actually used by the USG and how the literature has evolved over time. The tabulations in EPA 2023 p. 81 show that if they had not changed the Ag productivity assumption and added a large mortality cost they’d have ended up with SCC numbers very close to the 2013 IWG numbers. Assuming very low discount rates did the rest. Using the FaIR model with the DSCIM and GIVE damage modules wasn’t the key change, it was the changed assumptions about damage drivers and discounting. • EPA (2016) “Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 Interagency Working Group on Social Cost of Greenhouse Gases, United States Government.” https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf • EPA (2023) “Supplementary Material for the Regulatory Impact Analysis for the Final Rulemaking, ‘Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review’ – EPA Report on the Social Cost of Greenhouse Gases: Estimates Incorporating Recent Scientific Advances.” Docket ID No. EPA-HQ-OAR-2021-0317. https://www.epa.gov/system/files/documents/2023-12/epa_scghg_2023_report_final.pdf § NAS (2017) “Valuing Climate Damages. Updating Estimation of the Social Cost of Carbon Dioxide” https://nap.nationalacademies.org/catalog/24651/valuing-climate-damages-updating-estimation-of-the-social-cost-of
11	123	2	• “It should also be noted that the SCC is focused on the social costs of CO2 emissions from fossil fuel use. It does not measure the private marginal benefits to consumers and society from the availability of fossil fuels. Public willingness to pay for fuels of all types indicates the value to society of reliable, abundant fossil energy.” • Two points to make about this section. First, the benefits to society generally accrue from the provision of energy services, not from specific fuels.” A distinction without a difference in this context. Second, the private marginal benefit of the availability of fossil fuels or energy services is not part of the SCC because changes in the cost and provision of the energy services should be part of the other side of the cost benefit analysis. The SCC is used to characterize the benefits of GHG emissions abatement, and the changes in the costs and availability of energy services are part of the cost of emissions abatement. Agreed, changed the wording to clarify
11	125	5	• “the uncertainty of SCC estimates doesn’t mean that other regulatory measures are inherently better or more efficient.” • ‘regulatory measures’ is a poor word choice here as it can be confused with the regulation itself instead of the metric used to assess the regulation. Changed measures to instruments

11	123-125	Section 11.1	• Section 11.2.4 has an interesting discussion of tipping points. This is an active area of research in the field, however it needs to be noted that tipping points or tipping elements are not included in the SC-GHG as used by the USG, see EPA (2023). • EPA (2023), page 3 says, “For example, the modeling in this report omits most of the consequences of changes in precipitation, damages from extreme weather events, the potential for nongradual damages from passing critical thresholds (e.g., tipping elements) in natural or socioeconomic systems, and nonclimate mediated effects of GHG emissions other than CO2 fertilization (e.g., ocean acidification due to CO2 emissions, tropospheric ozone formation due to CH4 emissions). Importantly, this update does not yet reflect interaction effects and feedback effects within, and across, natural and human systems. For example, it does not explicitly reflect potential interactions among damage categories, such as those stemming from the interdependencies of energy, water, and land use. These interactions and feedbacks, and others, were highlighted by the National Academies as an important area of future research for longer-term enhancements in the SC-GHG estimation framework.” Not necessary to say this since EPA is on hold from doing SCC calculations
12	129	1	• This chapter summary is misleading as it is describing change from today’s temperature rather than the effect on future temperatures. A change from today’s temperature is the future temperature. Not sure what the objection is.
12	129	2	• “And even if global emissions were to stop tomorrow, it would take decades or centuries to see a meaningful reduction in the global CO2 concentration and hence human influences on the climate.” • If global emissions were to go to zero tomorrow, CO2 concentrations would stabilize, and global temperature would be approximately constant. Net negative CO2 would result in reductions of concentrations and temperatures. In other words, while reducing global CO2 emissions to zero might not lead to near-term reductions in CO2 concentrations from today’s levels, it would stop future increases in CO2 concentrations. Consistent with what we stated.
12	129	3	• This section is focused on unilateral action, but needs to address questions related to collective action and individual actions by multiple parties when the benefits of abatement and the damages from emissions have extensive externalities. • Kotchen (2021) provides a theoretical perspective on the global vs. domestic SCC question and addresses questions related to how an individual country’s decisions are impacted by the expected choices of other countries given that GHG emissions are globally mixed the benefits of GHG abatement are shared widely. • Kotchen (2021). Which Social Cost of Carbon? A Theoretical Perspective. Journal of the Association of Environmental and Resource Economists. https://doi.org/10.1086/697241 An interesting line of thought but we can’t get into game theoretic models here.
12	129	4	• “Since that rate has been averaging about 50 percent of emissions in recent decades, a reduction of global emissions by 50 percent would (at least temporarily) halt the rise in atmospheric CO2.” • This may be addressed in earlier chapters that this reviewer has not read yet, but the standard framing is that stabilizing CO2 concentrations requires balancing emissions by sources and removals by sinks. Removals by sinks includes both natural sequestration and anthropogenic sequestration (e.g. afforestation if it can be done that increases the overall land sink removal, or direct air capture). It could be useful to clarify this here. The discussion is only an approximation for illustrative purposes
12	129	5	• “Lomborg (2016) estimated that full compliance with the Paris Accord would not stop warming, it would only prevent about 0.1C warming and delay hitting the baseline year 2100 temperature levels by about a decade.” • Note that the Lomborg (2016) finding is related to, “the of impact of the total, global emission cuts implied by all the submitted INDCs,” this is different than ‘full compliance with the Paris Accord’ as the INDCs analyzed in the paper are only the first round of Intended Nationally Determined Contributions submitted ahead of COP-21, and the Paris Accord requires additional Nationally Determined Contributions every 5 years. Since Lomborg (2016) only analyzes these INDCs, and parties have submitted two rounds of NDCs since then, suggest changing the wording here to, “... full compliance with initial commitments submitted ahead of the Paris Accord.” Changed to reflect this.

12	129	Chapter	• [NOTE: this comment is long and could be difficult to read in excel. It is included here once as a full comment, then again broken into multiple parts for ease of reading. This is PART 1] • Section 12.1 is titled, “The scale of the problem,” is framed around contrasting criteria air contaminants with CO2 emissions; however, there really are three separate issues that need to be disentangled: Stock vs. Flow. • The challenge here is that abatement costs borne by people today benefit people in the future – temporal externalities. • CO2 emissions are a stock pollutant, so impacts depend on the cumulative emissions to date, whereas traditional criteria are a flow pollutant and impacts depend on the emissions at that point in time. Emissions of a stock pollutant going to zero will not affect impacts at that point in time, as the stock remains unchanged, but will have large impacts in the future as the stock will cease to increase until emissions resume; whereas emissions of a flow pollutant going to zero will immediately eliminate impacts, but impacts will have no lasting effects on future impacts as they will immediately resume when emissions resume. • The sentence at the end of the second paragraph of this section reads, “And even if global emissions were to stop tomorrow, it would take decades or centuries to see a meaningful reduction in the global CO2 concentration and hence human influences on the climate.” This is conflating the expectations of how stock and flow pollutants work – if global emissions were to stop tomorrow, the fact that there would be no meaningful reduction in global CO2 concentrations is simply the nature of how stock pollutants work, but there would be very large impacts on future temperatures since the stock would cease to increase. Conflating isn’t the right word. We are pointing out the stock-flow issue. • The stock nature of CO2 emissions is a real challenge for justifying CO2 emissions reductions, but it is centered on justifying the costs of abatement being born by people today in order to create a stream of benefits that grow over time and primarily accrue to future generations. This leads to questions important questions about how decision-makers should think about inter-generational discounting, and what costs should or should not be borne today for the benefit of future generations that will potentially be substantially better off. Dealt with in the IAMs section • It’s worth noting that since CH4 emissions are relatively short lived, they behave much more like a flow pollutant than a stock pollutant. If CH4 emissions went to zero, concentrations would fall relatively quickly, and the temperature effects would happen on a much shorter timescale, but if CH4 emissions fully resumed, concentrations would return to previous levels there would be no lasting impact of the previous reductions. This is to point out that the stock vs. flow distinction also happens between different greenhouse gasses and is not purely a distinction between GHG emission and criteria pollutants. The CH4 case is interesting and we haven’t looked at it. Also natural sources and sinks are complicated for CH4
12	129	Chapter	• [NOTE: this comment is long and could be difficult to read in excel. It is included here once as a full comment, then again broken into multiple parts for ease of reading. This is PART 2] • Globally mixed. • The challenge here is that abatement costs borne by people in one location benefit people in other locations – spatial externalities. • The next issue is that GHG emissions are globally mixed, so that emissions in any one location have impacts all over the world. This is a distinct issue from the stock vs. flow issue, as the CH4 example above showed a flow pollutant can also be globally mixed. One can also consider a stock pollutant that is not globally mixed, such as groundwater pollution that depends on the stock of contaminants accumulating in the groundwater not just the flow in any one time period as one would see in surface water pollution. • The globally mixed nature of GHG emissions is a real problem for justifying climate policy as the benefits of any one country’s actions primarily accrue to people in other countries. Conversely, a country benefits from the actions of every other country, not just their own actions. This is a problem of game theory and collective action, as unilateral action may not be justified even if collective action would be. It’s worth noting that this isn’t just a problem of scale – these same problems arise for globally

			mixed CH4 emissions even though as noted above they behave more as a flow pollutant, and would arise for any globally mixed pollutant regardless of the scale of the problem. There is an extensive literature on transboundary pollution that explores these issues. Agree with all this, but discussing these points wouldn't change our overall conclusions
12	129	Chapter	• [NOTE: this comment is long and could be difficult to read in excel. It is included here once as a full comment, then again broken into multiple parts for ease of reading. This is PART 3] Scale. • The challenge here is that solving the problem requires enormous change and potentially enormous costs. However, individual actions need to be considered at the margin. • As discussed in this section and the comments above, stabilizing CO2 concentrations and stopping the increase in global mean temperature requires balancing anthropogenic emissions and removals by sinks. The level global mean temperature stabilizes at would generally depend on the cumulative CO2 emissions up to the point CO2 emissions on net go to zero (the stock of CO2 emissions), and the level of short-lived non-CO2 emissions at that time (the flow of non-CO2 emissions). This would involve an enormous change to the global energy system. The costs of this change would be highly dependent on the timing of reaching net-zero CO2 emissions – in 10 years by 2035 would involve crippling costs to the global economy, in 100 years by 2125 would involve a far more gradual transition and likely impose minimal costs when discounted back to today. • What is missing in this chapter is an acknowledgement that policy needs to be thought of at the margin. Do the marginal benefits of the policy equal or exceed the marginal costs? This is how economists think of these problems and the essence of how the government conducts cost-benefit analysis to inform decision-makers under E.O. 12866. The case study presented in section 12.2 poses the wrong two question. Showing that a policy's emissions reductions are small relative to global emissions, and the resulting impact on global temperatures is also small is tautological. No individual policy will solve climate change, but that does not mean that the individual policy is not justified. The relevant questions for decision makers are: (1) what is the cost of the marginal ton of emissions reductions by this policy? and (2) are those marginal costs smaller than the marginal benefit of a ton of emissions reductions? In practice, question (2) is very difficult to answer, and requires judgements about how to value benefits to Americans vs. benefits to the rest of the world, how to discount benefits that accrue to future generations, and how to consider the impacts U.S. actions have on the likelihood that other countries will take actions that benefit the U.S. These are difficult questions that need to be answered to justify climate policy, and this section would be improved by acknowledging that these are the questions that need to be addressed instead of the awkward argument that the problem is big, and individual policies are small therefore they can't be justified. Ch 12 is only focused on the scale problem. The reviewer is correct that even if the effects are small that doesn't mean they shouldn't be undertaken. Ch 11 is where the logic of cost-benefit analysis including marginal considerations is explored.

12	129	Chap ter	• [NOTE: this comment is long and could be difficult to read in excel. It is included here once as a full comment, then again broken into multiple parts for ease of reading. This is the full comment] • Section 12.1 is titled, “The scale of the problem,” is framed around contrasting criteria air contaminants with CO2 emissions; however, there really are three separate issues that need to be disentangled: § Stock vs. Flow. • The challenge here is that abatement costs borne by people today benefit people in the future – temporal externalities. • CO2 emissions are a stock pollutant, so impacts depend on the cumulative emissions to date, whereas traditional criteria are a flow pollutant and impacts depend on the emissions at that point in time. Emissions of a stock pollutant going to zero will not affect impacts at that point in time, as the stock remains unchanged, but will have large impacts in the future as the stock will cease to increase until emissions resume; whereas emissions of a flow pollutant going to zero will immediately eliminate impacts, but impacts will have no lasting effects on future impacts as they will immediately resume when emissions resume. • The sentence at the end of the second paragraph of this section reads, “And even if global emissions were to stop tomorrow, it would take decades or centuries to see a meaningful reduction in the global CO2 concentration and hence human influences on the climate.” This is conflating the expectations of how stock and flow pollutants work – if global emissions were to stop tomorrow, the fact that there would be no meaningful reduction in global CO2 concentrations is simply the nature of how stock pollutants work, but there would be very large impacts on future temperatures since the stock would cease to increase. • The stock nature of CO2 emissions is a real challenge for justifying CO2 emissions reductions, but it is centered on justifying the costs of abatement being born by people today in order to create a stream of benefits that grow over time and primarily accrue to future generations. This leads to questions important questions about how decision-makers should think about inter-generational discounting, and what costs should or should not be borne today for the benefit of future generations that will potentially be substantially better off. • It’s worth noting that since CH4 emissions are relatively short lived, they behave much more like a flow pollutant than a stock pollutant. If CH4 emissions went to zero, concentrations would fall relatively quickly, and the temperature effects would happen on a much shorter timescale, but if CH4 emissions fully resumed, concentrations would return to previous levels there would be no lasting impact of the previous reductions. This is to point out that the stock vs. flow distinction also happens between different greenhouse gasses and is not purely a distinction between GHG emission and criteria pollutants. § Globally mixed. • The challenge here is that abatement costs borne by people in one location benefit people in other locations – spatial externalities. • The next issue is that GHG emissions are globally mixed, so that emissions in any one location have impacts all over the world. This is a distinct issue from the stock vs. flow issue, as the CH4 example above showed a flow pollutant can also be globally mixed. One can also consider a stock pollutant that is not globally mixed, such as groundwater pollution that depends on the stock of contaminants accumulating in the groundwater not just the flow in any one time period as one would see in surface water pollution. • The globally mixed nature of GHG emissions is a real problem for justifying climate policy as the benefits of any one country’s actions primarily accrue to people in other countries. Conversely, a country benefits from the actions of every other country, not just their own actions. This is a problem of game theory and collective action, as unilateral action may not be justified even if collective action would be. It’s worth noting that this isn’t just a problem of scale – these same problems arise for globally mixed CH4 emissions even though as noted above they behave more as a flow pollutant, and would arise for any globally mixed pollutant regardless of the scale of the problem. There is an extensive literature on transboundary pollution that explores these issues. § Scale. • The challenge here is that solving the problem requires enormous change and potentially enormous costs. However, individual actions need to be considered at the margin. • As discussed in this section and the comments above, stabilizing CO2 concentrations and stopping the increase in global mean temperature requires balancing
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Ch	page	Para	Comment or Suggested Edit
2	5	Fig 2.2	The graph is not relevant to the discussion. It should only, at most, cover the time period since the last glacial maximum, which occurred ~20 kyr BCE, and common practice is to concentrate on the last 1000 years. Figure 2.2 has been deleted
3	11,12	Sec 3.1.1	There is no quantification of the effects of TSI and volcanic aerosols that would lead to modifications of the radiative forcing shown in the figures In Chapter 6 we discuss ranges of TSI forcing that even the IPCC acknowledges.
3	21,22	Sec 3.3	Many of the arguments and references are dated. Further, the challenge posed is to prove a negative, i.e. that the record used by AR6 is not biased by urban heat island effects. On the contrary, while verbally stating uncertainty, the authors cannot make a claim that the AR6 statement is false. Even if one were to accept the Soon, et al value of 0.89 deg C/century, the focus on the land surface warming completely neglects the contribution of the oceans to global surface temperature change, which must be considered in any discussion of surface temperature change. The underlying studies frame statistical tests appropriately to test for the presence or absence of an effect. Yes ,the literature is dated and the topic needs renewed attention. The question is bias in the land record, but no one is arguing all surface warming is due to urbanization.
4	30	Sec 4.4	The statement "TCR is more generally related to peak warming and better constrained by historical warming, than ECS." requires further context. While true that the "peak warming" rate achieves a maximum around 70 years, temperature increases continue for several centuries and approaches the ECS value asymptotically. Further, the Lewis (2023) arguments were placed in context by Sherwood and Forest (2024), that identified multiple recent ECS studies that showed, collectively, that the PDF in their original Sherwood, et al paper could not be narrowed. Additionally, the reference to Sherwood et al (2020) is incorrect. It omits many authors and the authors that are listed are not in the correct order. Reference to peak warming deleted.
5	37, 38	Sec 5.4	The analysis presented of the IPCC AR5 figure, Fig 5.6 in the current document, is outdated and should be removed. The issue IS addressed in the AR6, but not graphically, in the text reproduced by the authors. If the section is retained, it should be moved ahead of Section 5.3 to present the material in the correct order chronologically. The analysis in Fig. 5.6 matches the updated data in Fig 5.7, and it is relevant to show that the information was included in the AR5 but only in a figure in the Supplement. The order of presentation in the chapter is appropriate.
6	57	para 1	The conclusion "The rise in Tmin has been strongly related to the growing presence of manufactured surfaces around the weather stations over the last 100+ years (the so-called urban heat island effect; Section 3.3 and Spencer et al. 2025)." is only found in an author's self-citation of Spencer, et al, (2025) that does not appear in the references at the end of Chapter 6. Further, the trend of greater increases in Tmin relative to Tmax is documented and explained in Easterling, et al (1997). https://doi.org/10.1126/science.277.5324.364 ; Thorne, et al (2016) https://doi.org/10.1002/2015JD024584 . The trend cannot be attributed to UHI effects. We added citations to the literature to substantiate the point.

8	85	para 5	"... datasets with high TSI variability can explain more than 70 percent of the temperature variability since preindustrial times." Variability on what time scales? 11-year cycles? How would this impact the well documented surface temperature increase of > 1 deg C global temperature change since 1900? There is a whole spectrum of variability in TSI beyond the 11-year cycle. These are discussed in the papers we reference.
8	85,86,87	"Natural variability of large-scale ocean circulations"	The discussion neglects the influence of vertical mixing on surface temperature. The global ocean has warmed, as documented by increases in global ocean heat content, e.g. Murphy, et al (2009) doi:10.1029/2009JD012105 We do not understand the comment.
8	88,89	Optimal fingerprinting discussion	This section is hardly a balanced and objective review. The report authors are known opponents of optimal fingerprint approaches and have been a loud, but very small minority voice. It is interesting that even they conclude "...these analyses do not falsify results of the IPCC optimal fingerprinting method..." The point is that falsification would require redoing all the underlying studies. The findings so far show that the method is flawed and the justification for relying on it is invalid. The sentence has been rephrased for clarity.
8	90,91,92	Section 8.4	This discussion is incomplete and fails to take into account the extensive literature on cloud and surface albedo feedbacks.. There is an extensive discussion about the post 2015 period and recent record annual global surface temperatures, implying, but not stating, that recent changes are the result of natural variability, or decreases in atmospheric aerosol concentrations. Comparing the radiative forcing from these changes with long-term GHG forcing, particularly CO2 is misleading to the average reader. If the reduction in albedo can be tied to atmospheric cloud and aerosol changes, as the authors state, they cannot ignore the likelihood that the changes are the result of anthropogenic factors, i.e. sulfate aerosol reduction through cleaner technology and the well-documented positive low-cloud feedback. The discussion is incomplete because the underlying science is incomplete, as we emphasize. We are surveying a complex area of ongoing research without taking a strong position ourselves.

Full document			In the limited time allowed, this reviewer concentrated on sections related to the physical climate and climate change. Frankly, the document was discouraging. Secretary Wright wants a " ... a more thoughtful and science-based conversation about climate change and energy." I find that this report distorts the science in much the same way as the media coverage about which he complains. Most notable are the omissions or under-reported significant climate changes, such as sea-ice decline, changes in the global water cycle and increases in heat-stress due to increases in absolute humidity (from water-vapor feedback). Further, the examples used by the report authors are narrow and appear to be selected to emphasize uncertainty, while the more rigorously evaluated science that contradicts their limited discussion is ignored, perhaps because it does not fit their narrative. This is unfortunate, because I believe it detracts from the much needed discussion about the future, including energy policies, technologies and trade-offs. I encourage DOE to start the discussion by accepting the well-reviewed and broadly accepted scientific conclusions of the IPCC Working Group 1, with respect to the observations and analyses of climate change in the 20th and 21st centuries. Skepticism regarding predictions/projections of future climate based on posited scenarios is justified. As a member of the physical climate research community, I believe there are better uses for the models (and the computer resources they consume) than scenario projection simulations, to inform the discussion that is urgently needed about the future. Comments noted.
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Chapter Number	pg	para	Comment or Suggested Edit
Foreword	vii	4	The stated charge to the team was to summarize the current state of climate science, but in the Preface the team states that it chose to focus on topics that are downplayed in or absent from current assessment reports. To accurately describe the contents of the report, the Foreword should also state that the report is a summary of the things that the author team thinks have been downplayed in major climate assessment reports. Noted, the Preface has been modified. Our charge was not to summarize the whole of climate science.
Foreword	vii	8	The statement about climate change not being the greatest threat facing humanity is a value judgement. Since the Secretary criticizes others for blurring the line between scientific conclusions and policy recommendations in the second, fourth, and sixth paragraphs of this Foreword, it is hypocritical to offer a value judgement without clearly labeling it as such and noting that such conclusions must necessarily involve one's beliefs in addition to scientific information. We did not write the Secretary's foreword.
Exec Summ	viii	2	It is misleading (cherry picking) to only mention "global greening" (i.e., the influence of elevated CO2 on plant growth) here without also noting the impacts of elevated temperatures and changing precipitation patterns on ecosystem health and agricultural productivity. (This comment is also true of the underlying content on pages 3-7) This issue has been addressed with wording changes to acknowledge the other contributors.
Exec Summ	viii	2	It is misleading to state that ocean pH levels are within the range of natural variability. This statement is not true on the timescales governing the impacts of ocean acidification on ocean ecosystems and fisheries. (This comment is also true of the underlying content on pages 8-9) The statement has been removed.
Exec Summ	viii	3	It is inaccurate to say that "scenarios of CO2 emissions have tended to overestimate observed levels". As the authors themselves note on page 15, it is impossible to reliably predict societal behavior regarding energy production and other sources of emissions, so the climate science community has never provided or suggested that there is a single predictive scenario against which future emissions could be judged. Rather, there has always been a range of projected emissions scenarios, and emissions have always tracked within the envelope of those scenarios. The authors make a reasonable point in the full text about the large number of climate studies that have used RCP 8.5, whereas actual emissions have recently been closer to RCP 4.5. This would be a more appropriate finding to include here in the executive summary. The point being made here is that observations have tracked the low end of the envelopes, a problem going back decades. See Figure 3.2.1

Exec Summ	viii	4	Stating that climate models "offer little guidance on how the climate responds to elevated CO2" is at best an unjustified (and at worst a biased) judgement given that the authors chose to focus only on the shortcoming and deficiencies of these models, and do not account for the progress made in improving the ability of these models to reproduce many key aspects of observed climate change. The same is true for all of Chapter 5. It is informative for readers to see key ways in which models fail to match observations especially those most relevant for policy making. The continuing broad range of responses is an important limitation to their fitness for purpose.
Exec Summ	viii	5	Stating that climate models "generally run hot" is an inaccurate and misleading summary statement. A large number of papers and scientific assessments have validated the ability of climate models to accurately simulate many major aspects of global climate. Like all models, climate models are imperfect, and some models have recently shown a tendency to produce higher climate sensitivities--the IPCC AR6 acknowledged this "hot model problem" and there has been considerable discussion in the scientific literature about it and its implications for impacts studies. But this is a relatively recent phenomenon, and there could be other reasons for the recent mismatch (i.e., under-estimates of the reduction in aerosol cooling due to air pollution controls). A balanced scientific assessment would also note, for example, that climate model projections from the 1970s and 80s have accurately predicting the observed trend in global temperature over the past few decades. The question is not whether the models "accurately simulate many major aspects of global climate". It is rather whether the models accurately simulate the climate's response to anthropogenic influences. Our statements are substantiated by the Figures in Ch 5 (especially Figs 5.2 - 5.4). As we discuss, the problem of the tropospheric mismatch goes back decades.
Exec Summ	viii	6	It is misleading and inaccurate to say that most extreme weather events do not show long terms trends. It is true that some kinds of extreme events, like tornadoes, have not shown appreciable or detectable changes, and that changes in wildfire must account for changes in land management. But a "summary of the current state ofthe science" should acknowledge that there is clear evidence that heat waves are becoming more frequent and more extreme, extreme precipitation and nuisance flooding are becoming more common, etc. (This comment is also true of the underlying content in Part II) The chapter presents a great deal of data that substantiates our summary statement. We also provide clear indications on heatwave trends including where they are increasing in frequency. Our assessments match those in the IPCC and NCA documents.
Exec Summ	viii	6	It is misleading to state that the aggregate sea-level rise trend in U.S. tide gauges is not accelerating, because as noted in the same sentence, there are significant regional differences in SLR (primarily due to differences in land subsidence), so only looking at domestic gague data is insufficient to determine if sea-level rise--an inherently global process--is accelerating, with regional factors superimposed on that global trend. There is clear evidence that global sea level rise is accelerating. Moreover, while land subsidence has offset sea level rise in some U.S. regions, the opposite is true in others, and in those reasons the combined effects of sea level rise and subsidence are posing considerable risks to people and infrastructure in those regions...but this important context is omitted. (The same is true of the sea level rise analysis on pages 75-78.) We state that global sea level rise has accelerated in recent decades. The reviewer needs to provide evidence for the claim of acceleration. SLR is a regionally-heterogeneous phenomenon and we discuss the differences by location. We present tide-gauge data for many locations so readers can see the situation for themselves.

Exec Summ	viii	9	Most of the sentences in this paragraph are not factual in nature. For example, the call for uninterrupted observations of the global climate system is a research recommendaiton that is outside the remit of this report and is not supported by text within the document. The same sentence also implies that current emissions scenarios are not "realistic", which is not a defensible statement given that historical emissions have tracked within the envelope of previous emission projections (see comment above and Figure 3.2.2), and argues that climate models should address biases and uncertainties, which is something that every climate modeling team already spends an enourmous amount of time doing. If retained, the non-scientific portions of this paragraph should be moved to the Preface, and the misleading statements should be corrected. The paragraph has been moved to the end of Chapter 12. See above regarding emission scenarios.
Preface	ix	1	The focus on "whether carbon dioxide emissions engdanger the U.S. public" is slightly different from the stated focus in the Foreward on "the Nation's climate". This distinction is important because climate change and its impacts outside of U.S. borders can endanger the U.S. public both directly (e.g., global processes affecting sea level rise in the United States, or the impacts of climate change on overseas military installations) and indirectly (i.e., impacts of climate change on international agricultural production and trade dynamics). The reference to endangerment has been removed.
2	3	1	The two summary statements provide an extremely narrow and misleading view of "direct impacts of CO2 on the environment" (the chapter title). The most obvious direct impact of CO2, in the context of climate change, is its role in global radiative forcing, which is covered in the next chapter but not mentioned here. The chapter should at a minimum be retitled, but better yet combined with the following chapter which discusses other aspects of increasing CO2. The effect of CO2 on the climate takes up the bulk of the report.
2	3	2	It is misleading to state that ocean pH levels are within the range of natural variability. This statement is not true on the timescales governing the impacts of ocean acidification on ocean ecosystems, fisheries, and other processes. The evidence we cite shows that pH levels are in the range of natural variability. Whether the rate of change is, is much more difficult to establish because of the limitations of paleo records. Also the spatial heterogeneity is not subject to comprehensive measurement, which precludes straightforward assessment.
2	5	1	It is misleading to show (only) a graph of CO2 levels over hundreds of millions of years. These timescales are generally not relevant to processes and issues surrounding anthropogenic CO2 increases. For example the authors in multiple places make statements about CO2 levels during the last glacial maximum, but those fluctuations are indetectable on a graph with such a long timescale. The figure has been removed.
2	8	1	Acidification is not a misnomer...the word literally means to make something more acidic, which is what is happening. The authors may choose to argue that the term is misleading since the oceans are slightly basic, but that is not the same thing as a misnomer. We consider it a misnomer for the reasons stated. The oceans are not becoming acidic.

2	8	1	It is misleading and largely irrelevant to discuss ocean pH levels tens of thousands or millions of years ago, because that timescale is not relevant to the impacts associated with anthropogenic ocean acidification on ocean life. It is well documented that recent changes in ocean pH are happening ~100 times faster than natural fluctuations prior to human CO2 emissions, and marine species must adapt to changes in conditions on timescales of a few of their lifetimes, which is clearly not millions of years. The reviewer needs to provide specific sources for these statements. Also, it is a relevant point to make if current marine life evolved under conditions of much lower pH.
2	9	4	Similar to previous comment--changes in marine life over hundreds of millions of year has little relevance to the survival of marine species on decadal timescales due to anthropogenic ocean acidification. Are the authors trying to suggest that U.S. society would be well served by going back to conditions during the Jurassic? See earlier response.
3	13	2	The IPCC probably discounted the results reported in Connolly (2021) because that study included methodological errors that were documented in several subsequently publications, which the authors do not acknowledge. A serious assessment of TSI would not cherry-pick a single study, especially one that has been shown to include serious errors. The reviewer is probably referring to a comment by Richardson and Benestad, but Connolly et al. replied effectively to their critique.
3	14	4	It is unclear what the authors mean by "other natural sources of energy imbalance". If the authors are aware of a plausible additional source of energy imbalance they should state what it is rather than making vague statements without providing any evidence that such sources might exist. Surely the reviewer acknowledges that there are unknowns in the climate system
3	14	5	This is one of several places where the authors discuss the CO2 levels at which C3 plants begin dying in the context of the last glacial maximum. This is misleading, because there is no evidence that CO2 levels would have continued falling below the levels of the last glacial maximum, and irrelevant to the stated focus of this report, because they rebounded to 280 ppm many centuries before human activities began producing large amounts of CO2. The reviewer needs to provide evidence for the assertion that CO2 levels would not have continued falling.
3	15	1	The oceans and land surface absorb more like 60% of CO2 emissions. The 50% figure is repeated multiple times in the ensuing pages and should be corrected. We are unfamiliar with the 60% number; the sources with which we are familiar generally report numbers closer to 50%. The reviewer has not cited any sources for his or her statement.
3	20	2	The final sentence on this page is misleading and confusing as written. Most studies of the land carbon sink suggest that the rate at which it is increasing is declining, and several studies suggest that the ocean sink is declining. The authors should also explain the relevance of their statements here, because it isn't clear. Our statement is consistent with the sources we cite. Unfortunately the reviewer did not provide references.
4	26	6	The inclusion of a paragraph with high-level summary statements about climate policy here is confusing and inappropriate. This content belongs in chapter 11. We only make a brief introductory statement and otherwise defer the discussion to Ch 11.

4	29	1	The point about observed global temperature trends being consistent with both high-ECS high-aerosol and low-ECS low-aerosol worlds is an important one. It would be good to acknowledge that uncertainty in ECS is not just due to uncertainties in climate models, but also the lack of accurate measurements of pre-industrial aerosols and thus anthropogenic changes in aerosol forcing. And this uncertainty cuts both ways--if we live in a high-ECS world that has been "masked" by strong aerosol cooling, reducing air pollution could result in rapid warming (and this may be linked to the "hot model" problem as well). Agreed
4	29	2	The point about ECS values derived from past climate states (especially cooler ones) possibly not being totally representative of the current climate is another good point, one that would be good to acknowledge in their earlier and later discussions about uncertainty and the rationales for emissions reductions (e.g., on page 26 and in Chapter 11). Agreed.
4	30	1	The relatively shallow treatment on TCR relative to ECS here is puzzling, since the authors acknowledge that it is better constrained, and it is also a more relevant value for projected warming over the next several decades. The first sentence here also describes it as an observational constraint, but it is not, it is a metric that can be produced from either data or models (or both), and climate models are routinely used to run TCR experiments. ECS is more widely-used than TCR which is why we focus more attention on it.
5	32	1	A more accurate title of this chapter would be "deficiencies in climate models" because the authors focus almost exclusively on processes and features that models have struggled to reproduce, rather than a balanced assessment that also indicates what these models do well. We changed the title to take this into account.
5	34	1	Scafetta (2023) has been widely criticized in the scientific literature for its methods and conclusions. These results should not be presented without acknowledging these concerns, or better yet, the authors should attempt to survey the literature on this topic rather than presenting results from a single controversial paper. The reviewer is referring to an exchange regarding a different paper. We are unaware of any published critiques of the Scafetta paper we cite.
5	34	2	Spencer (2024) is not a peer reviewed journal paper and is not really appropriate to include here when there are many papers on this topic that have been peer reviewed. The reviewer should have provided references. We are unaware of any peer reviewed papers that present the comparison we show. We provide traceable accounts for the underlying data, all of which is from official sources.
5	35	1	The statement that the signal for anthropogenic greenhouse warming emerges first and most strongly is not supported and is inconsistent with my understanding of climate dynamics. The following sentence is also dubious (and probably backwards) since models run with observed surface temperatures tend to produce much better mid-tropospheric temperature simulations. The statement about early and strong emergence of the CO2 signal in the tropical troposphere is in the IPCC TAR and subsequent reports. Even models constrained with observed sea surface temperatures produce excess amplification aloft.

5	36	1	In most places the authors correctly describe the discrepancy between models and observations as a mismatch, which is appropriate because observations of mid-tropospheric temperatures are also subject to uncertainty (as indicated in the error bars in Figure 5.4). This is one of the reasons for the IPCC confidence assessment noted in the following paragraphs. However, here and in a few other places in this section the writing implies that differences can be solely attributed to model deficiencies. We don't take a position on the ultimate cause however we do note that the biases are pervasive across models and multiple observational data sets.
5	37	1	This section should be combined with the previous one as it is really just elaborating on the same discrepancy between climate models and observational estimates of tropospheric temperatures. One section discusses the discrepancy of trends and the other discusses the discrepancy of amplification rates, which is why the sections are separate.
5	39	1	There has indeed been considerable controversy about this particular metric. It is curious that the authors choose to cite two older papers here (2008 and 2009) rather than the rich recent literature, especially since they went to the trouble of updating on of their graphics with 2024 data. Recommend including a more balanced assessment of this discrepancy, it's potential causes, and recent efforts to address it, as well as noting that climate models are able to accurately capture many other aspects of climate change. Again, it is unfortunate that the reviewer did not provide any citations to this rich recent literature. We cited the key papers we are aware of.
5	39	1	This entire section is very misleading as it cherry-picks a specific result and takes it out of important context. The reason why stratospheric cooling has slowed (and, at least in one study, even warmed) in the past two decades is due to the recovery of the ozone layer. This is clearly stated in the Philipona et al article cited by the authors and in the IPCC report. Additionally, satellite-based estimates of stratospheric temperature (which is data the authors highlight in the previous section) do not show the same trends. This section should be removed or amended to note that stratospheric temperatures are influenced by multiple factors and that a comprehensive analysis of stratospheric temperature trends is fully consistent with those projected under climate warming scenarios. We have added a sentence discussing the ozone recovery issue and make reference to the recent Santer et al. study.
5	41	1	Many observational studies have shown that snow cover is decreasing, and have explained why it is more meaningful and useful to look at spring trends in snow cover, as well as why observations of snow cover can be uncertain. The issue here is model projections versus observations. Again, the reviewer provides no citations.
5	42	4	The authors provide a relatively accurate survey of results regarding hurricane numbers and landfall frequency, which have indeed not shown any trends. But their analysis of hurricane intensity, which has been shown in many studies to increase, is lacking...the chart showing just estimated windspeeds of the top ten landfalling storms is really weak given the analytical talents of the author team. They also do not provide any discussion of the physical basis for why hurricane numbers may not be changing while the intensity of the strongest hurricanes is expected to increase, nor analyze any data in the context of those conclusions.

			The challenge for global intensity metrics is that the satellite record prior to 1980-1990 (experts disagree on the data quality during this period) is inadequate, which is why we focus on the Atlantic hurricane data. Also there is no theory for hurricane number; that is a topic associated with substantial uncertainty.
6	47	5	Long term persistence is not a recognized property or phenomenon associated with rainfall data. The use of such a statistical technique, especially one that is not widely recognized or used in the hydroclimate community, demands additional justification. We have rewritten the text to remove specific reference to LTP.
6	53	4	The authors have cherry picked results throughout this section. For example, they have selected only a few quotes from IPCC and NCA describing extreme heat. The absolute single daily maximum temperature for a given year, for example, is a poor statistic for assessing statistical changes in extreme heat (it would be like comparing the tallest person in each country to try to calculate change in average height). A complete and comprehensive review of the underlying assessments and the data it cites clearly shows that extreme heat has been increasing in North America. The reviewer fails to identify any data or conclusion from the IPCC or NCA that differs from our assessment, and fails to cite any sources to justify this comment.
6	56	1	The "climate less prone to extremes" is a misleading statement. If minimum temperatures are increasing faster than maximum temperatures (which is an expectation of climate change based on basic physical principals), then the difference between warm and cold extremes on many timescales is expected to decrease. There are reasonable points to be made regarding observational deficiencies, regional variations in extreme events, and the potential benefits of reductions in extreme cold, rather than coming up with misleading statistics. But we show that extreme heat has also declined since the 1930s – Figures 6.3.1 and 6.3.3 refute the reviewer's statement.
6	58	3	The NCA5 heading is not a controversial statement, it simply says that things are changing, which they are by the author's own admissions and graphs. It does not suggest pervasive positive trends, as the authors suggest it does. We're not sure what sentence the reviewer is referring to.
6	61	3	The statistical techniques used in the 2019 paper are highly non-standard for evaluating precipitation statistics, and the 2024 results have not been peer reviewed. The results reported in the NCA and IPCC and the underlying studies have clearly demonstrated that extreme precipitation is increasing. The 2019 paper uses ordinary least squares to compute the trend, and a well-known variance estimator from the econometrics literature to assess significance. As we point out, we also find evidence of increasing precipitation averages and extremes but only when selecting certain start dates.

6	61	7	The relevance of the paragraph on 19th century and paleoclimatic rainfall events is unclear. If anything, the fact that such extremes have occurred in the past argues for more aggressive adaptation measures to ensure that damages won't be as high if they happen again (even notwithstanding potential changes in risk due to climate change). Note, however, that additional context is provided in the box that follows two pages later. We agree that discovery of extreme events in the 19th century records indicates that disaster planning may need to encompass a wider range of risks.
6	62	1	The choice of looking at (only) 5-day precipitation totals is questionable. Most rainfall events, including the most extreme and damaging precipitation events, are typically on a daily timescale. Again, the reviewer provides no citations or evidence. Our results are robust to different day intervals, and we refer to 1- and 2-day results as well.
6	68	3	Perhaps this is more germane to the sea level rise section, but nuisance (high tide) flooding due to sea level rise has been observed across much of the united states. This is a topic we did not address.

From: Judith Curry <curry.judith@gmail.com>
Sent: Monday, August 4, 2025 11:10 AM
To: Steven Koonin
Cc: Woods, Andrea; climateman60@gmail.com; roy.spencer@nsstc.uah.edu; ross.mckitrick@gmail.com; Barrios, Audrey
Subject: Re: Question from New Yorker - AI use in DOE report

I used it to search for quotes in the IPCC Report

On Mon, Aug 4, 2025 at 8:01 AM Steven Koonin <koonin@stanford.edu> wrote:

At one point, I used an LLM analysis to “de-snark” the nearly final text. But, to my knowledge, there was no AI use for substantive content or citations.

Dr. Steven E. Koonin

Edward Teller Senior Fellow

Hoover Institution/Stanford University

koonin@stanford.edu

From: Woods, Andrea <andrea.woods@hq.doe.gov>
Sent: Monday, August 4, 2025 10:24 AM
To: Steven Koonin <koonin@stanford.edu>; climateman60@gmail.com; roy.spencer@nsstc.uah.edu; curry.judith@gmail.com; ross.mckitrick@gmail.com
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We received an inquiry from the New Yorker over the weekend with claims from unnamed scientists whose work was cited in the DOE report arguing that their work was not cited correctly, and this could indicate that AI was used to compile the report. The claims seem very flimsy and we'll still provide a statement urging these unnamed scientists to submit their comments to the docket, but I wanted to check in with the group. Were any AI tools used?

I don't see any major issues with us utilizing AI tools to complete citations, but if AI was not used at all, we'll note this for the reporter in our response.

Thanks!

Andrea



Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Monday, August 4, 2025 11:10 AM
To: John Christy
Cc: Steven Koonin; Woods, Andrea; roy.spencer@nsstc.uah.edu; curry.judith@gmail.com; Barrios, Audrey
Subject: Re: Question from New Yorker - AI use in DOE report

Correct. AI did not determine the content.

It's notable that the unnamed scientists think that misrepresentation of their work implies AI was used.

On Mon, Aug 4, 2025 at 11:03 AM John Christy <climateman60@gmail.com> wrote:
Agreed. AI was not used to influence the content.

John C.

On Mon, Aug 4, 2025 at 10:01 AM Steven Koonin <koonin@stanford.edu> wrote:

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Sent: Monday, August 4, 2025 11:02 AM
To: Woods, Andrea; climateman60@gmail.com; roy.spencer@nsstc.uah.edu; curry.judith@gmail.com; ross.mckitrick@gmail.com
Cc: Barrios, Audrey
Subject: RE: Question from New Yorker - AI use in DOE report

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From: John Christy <climateman60@gmail.com>
Sent: Sunday, August 24, 2025 3:45 PM
To: Steven Koonin
Cc: Judith Curry; Ross McKittrick; Roy Spencer
Subject: Re: our zoom just now

I've seen the claim now a number of times that we dredge up "tired old arguments" that have been refuted. Does any one ever identify what these "arguments" are?

John C.

Sent from my iPhone

On Aug 24, 2025, at 2:30 PM, John Christy <climateman60@gmail.com> wrote:

<https://justthenews.com/politics-policy/energy/energy-advocates-ask-ag-bondi-investigate-agency-they-say-biasing-judges>

Sent from my iPhone

On Aug 23, 2025, at 3:48 PM, Steven Koonin <steven.koonin@gmail.com> wrote:

Here's a link to that comment: <https://www.regulations.gov/comment/DOE-HQ-2025-0207-0182>

The comment focuses on increases in heat-related mortality. We've no problem with that, I think. Rather, the question is whether cold-related mortality is declining as, or more, rapidly.

Getting a consistent ordering of the comments would require web-scraping skills beyond what I can muster.

SEK

From: John Christy <climateman60@gmail.com>
Sent: Saturday, August 23, 2025 4:14 PM
To: Steve Koonin <steven.koonin@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Roy Spencer <roywspencer@hotmail.com>
Subject: Re: our zoom just now

All

I've gone through about 50 comments. Vast majority are complaints or kudos with no specific actions to take. One, however, (#0182) did claim that section 10.3 is wrong about heat mortality (saying we used old publications) and that heat mortality is increasing offering several recent citations.

Attached is my feeble attempt to keep track of these. However, sometimes when I return to the comment page, the comments have been re-configured, making it difficult to track where I am. Is there a way to re-order the comments, say in numerical order?

John C.

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Director, Earth System Science Center
Professor, Atmos and Earth Science
Alabama State Climatologist
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From: John Christy [climateman60@gmail.com]
Sent: 8/23/2025 8:13:30 PM
To: Steve Koonin [steven.koonin@gmail.com]
CC: Judith Curry [curry.judith@gmail.com]; Ross McKittrick [ross.mckittrick@gmail.com]; Roy Spencer [roywspencer@hotmail.com]
Subject: Re: our zoom just now
Attachments: Untitled attachment.htm; DoE_Public_Comments_JRC_250823.xlsx; Untitled attachment.htm

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[OBU]

> On Aug 22, 2025, at 3:24 PM, Steven Koonin <steven.koonin@gmail.com> wrote:
>
> That zoom was a bit of a bust. No meaningful information conveyed to us, just "Wait until Monday's meeting."
>
> I'm concerned we're going to hear "full stop" from the lawyers. That would not be good.
>
> SEK

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NS = No Specifics

Is convinced extreme weather is getting worse due to humans. NS

Kudos to CWG. Many comments on earth's climate history. NS

"Appalled". Advises global values of increasing extremes (but did not contradict US extremes)

Water vapor enhancement issues. NS

Suggests Dark Matter (Dark Energy) may be important. NS

Kudos to CWG

Kudos to CWG. Comments on radiation and CO2 v Temp causality

"Cherry-picking, non publishing climate scientists paid by fossil fuel interests", NS

Advises checking US Temperatures for negating CO2 v Temp relationship. NS

Kudos to CWG

GMST is meaningless - ref. C. Essex

PDF document. Complains of process, indicating the Secretary is at fault. NS
Complaints, NS

PDF. Misrepresenting ECS, Solar Variability, extreme events, sea level rise, scenarios, UHI, etc. No counter

Kudos to CWG

Kudos to CWG

Kudos to CWG

Links to reports that scientists claim they were misused in CWG. NS

Very Long, Advises geoengineering. NS

"citations aren't real, clear use of AI". NS

Kudos to CWG

Kudos to CWG

Advise deferring to "Global Expert Consensus" or IPCC. NS

Kudos to CWG

Suspects AI likely did the report. Claims error in citation Lee, S., Byrne, et al 2024. Wrong paper.

Complaints, NS

Kudos to CWG, mitigation must be stopped

Kudos to CWG

Complaints, NS, Christy and Spencer use "fake data"

Complaints, NS

Complaints that extreme weather section is "misleading". Needs "viewpoint diversity". NS

Advises citing statistics for last 20 years on health impacts to capture very recent trends.

"laughable". NS

Claims of extreme weather are "categorically false". CO2 is poisonous. NS

Complaints, NS

"Child's statement of lies." NS

Claims heat mortality section based on old publications. Provides others that say heat mortality is increasing. Kudos to CWG. Notes that Grok's analysis of the report is misleading.

Complaints, NS

Complaints, NS

"Blatently false information". NS

Misleading comments on McKinnons paper, advises stating background is warming in PacNw

Expectant mom wants to save her child from climate change. NS

Complaints, NS

Sec 6.2 - wants slope and p-value for hurricane trends

"foolish and hubristic". NS

^evidence offered.

sing. Sec 10.3

On Aug 22, 2025, at 3:24 PM, Steven Koonin <steven.koonin@gmail.com> wrote:

That zoom was a bit of a bust. No meaningful information conveyed to us, just "Wait until Monday's meeting."

I'm concerned we're going to hear "full stop" from the lawyers. That would not be good.

SEK

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Friday, August 22, 2025 7:34 PM
To: Judith Curry
Cc: Steven Koonin; Roy Spencer; John Christy
Subject: Re: our zoom just now

Based on my conversation early on with him I doubt the Secretary was surprised at the reaction of the academic community to the report.

On Fri, Aug 22, 2025 at 3:05 PM Judith Curry <curry.judith@gmail.com> wrote:
I think it is the lawyers and not the secy

On Fri, Aug 22, 2025 at 2:28 PM Steven Koonin <steven.koonin@gmail.com> wrote:
Roy, you might be right. If so, I should probably have a word with him.

I don't see anything that should stop us talking among ourselves and working through Monday. We're all private citizens (except for Roy as an SGE, who will be in a few weeks).

For me, it's now a point of pride that we respond seriously to serious criticisms. Not to do so would look (and be) very bad.

Steven E. Koonin

On Aug 22, 2025, at 17:17, Roy Spencer <roywspencer@hotmail.com> wrote:

I wonder if the Secretary was a little blindsided by the negative comments from the science community. I totally expected it, and as you all have mentioned there has been little of substance to them.

Sent from my Verizon, Samsung Galaxy smartphone

----- Original message -----

From: Steven Koonin <steven.koonin@gmail.com>
Date: 8/22/25 3:24 PM (GMT-06:00)
To: 'Judith Curry' <curry.judith@gmail.com>, 'John Christy' <climatemanager60@gmail.com>
Cc: 'Ross McKittrick' <ross.mckittrick@gmail.com>, 'Roy Spencer' <roywspencer@hotmail.com>
Subject: our zoom just now

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SEK

--



Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Judith Curry <curry.judith@gmail.com>
Sent: Friday, August 22, 2025 6:06 PM
To: Steven Koonin
Cc: Roy Spencer; John Christy; Ross McKittrick
Subject: Re: our zoom just now

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On Fri, Aug 22, 2025 at 2:28 PM Steven Koonin <steven.koonin@gmail.com> wrote:
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curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: John Christy <climateman60@gmail.com>
Sent: Friday, August 22, 2025 5:51 PM
To: Steven Koonin
Cc: Roy Spencer; Judith Curry; Ross McKittrick
Subject: Re: our zoom just now

I intend to spend a little time on comments, though I've yet to find one that requires a response. If you see one that pertains to the data analysis I've done, let me know the file number and I'll put something together.

The TObs/SetMax issue brought up by Zeke and Andy turns out to be detectable but small, reducing the number of heatwave days in the 1930s by about 4 percent - not enough to see in the diagram nor change our conclusions.

John C.

On Fri, Aug 22, 2025 at 4:28 PM Steven Koonin <steven.koonin@gmail.com> wrote:
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SEK

From: Judith Curry <curry.judith@gmail.com>
Sent: Friday, August 22, 2025 4:56 PM
To: Ross McKittrick
Cc: Steven Koonin; John Christy; Roy Spencer
Subject: Re: our zoom just now

Yes this is worse than anything i imagined. I will keep working over the weekend, since this is the last time i will have for awhile to do anything on this (i'll take my chances)

On Fri, Aug 22, 2025 at 1:36 PM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

Wouldn't a full stop also mean a full stop on public comments?

Also, it's not clear to me how they could stop us from talking among ourselves and getting through the review comments. I've been tied up all week teaching a course in Vancouver. I had planned to get started on the comments next week.

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Judith Curry, President
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curry.judith@cfanclimate.com | +1.404.803.2012
<http://www.cfanclimate.net>

From: Ross McKittrick <ross.mckitrick@gmail.com>
Sent: Friday, August 22, 2025 4:37 PM
To: Steven Koonin
Cc: Judith Curry; John Christy; Roy Spencer
Subject: Re: our zoom just now

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Sent: Friday, August 22, 2025 4:25 PM
To: 'Judith Curry'; 'John Christy'
Cc: 'Ross McKittrick'; 'Roy Spencer'
Subject: our zoom just now

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SEK

From: Ison, Jeremy T. <jeremy.ison@hq.doe.gov>
Sent: Wednesday, August 6, 2025 5:58 PM
To: Judith Curry
Cc: Steven Koonin; Ross McKittrick; Roy Spencer; John Christy
Subject: Re: [EXTERNAL] Re: List of external reviewers

All,

Many thanks. Please communicate directly with me going forward. Moving Audrey and Travis to Bcc.

I will be in touch soon.

Thank you,
Jeremy

From: Judith Curry <curry.judith@gmail.com>
Sent: Wednesday, August 6, 2025 5:47 PM
To: Travis Fisher <travis.scott.fisher@gmail.com>; Ison, Jeremy T. <jeremy.ison@hq.doe.gov>; Barrios, Audrey <audrey.barrios@hq.doe.gov>
Cc: Steven Koonin <steven.koonin@gmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; John Christy <climateman60@gmail.com>
Subject: [EXTERNAL] Re: List of external reviewers

Hello Jeremy and Audrey,

Below is the list of scientists we recommend for external peer review. Let us know if you want further info on each of these individuals and emails.

Lennaert Bengtsson (Max Planck)
Isaac Held (Princeton, NAS)
Clara Deser (NCAR, NAS)
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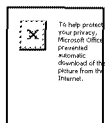
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Use caution if this message contains attachments, links or requests for information.

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Hello Jeremy and Audrey,

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Sent: Wednesday, August 6, 2025 4:51 PM
To: Steven Koonin
Cc: Ross McKittrick; Judith Curry; Roy Spencer; John Christy
Subject: Re: List of external reviewers

Make sure this list gets to Jeremy Ison and Audrey Barrios at DOE!

On Wed, Aug 6, 2025 at 2:19 PM Steven Koonin <steven.koonin@gmail.com> wrote:
I know Matt well as a Hoover colleague. Agree that he'd be good.

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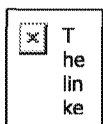
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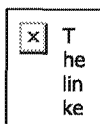
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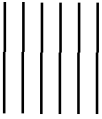
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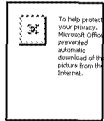


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CC: 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]; 'John Christy' [climateman60@gmail.com]
Subject: RE: List of external reviewers
Attachments: ~WRD2301.jpg

Inez Fung at Berkeley is my go-to carbon cycle person. <https://vcresearch.berkeley.edu/faculty/inez-fung>

But perhaps she's already been one of our reviewers or is disqualified because of her joint position at LBNL?

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As I've discussed with Ross, Andrew Gelman at Columbia is a credentialed statistician who has weighed in on climate matters. See <https://sites.stat.columbia.edu/gelman/>

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Subject: Re: local effect of CO2

I suppose one could separate direct (toxic) and indirect (adds a tiny bit of warming - maybe) which may impact health, but certainly less so than the urban heat island itself. How would one separate UHI from the tiny CO2 forcing?

John C.

On Tue, Aug 5, 2025 at 4:26 PM Ross McKittrick <ross.mckittrick@gmail.com> wrote:

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Not true:

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Higher temperatures are also directly responsible for longer dry seasons and drier wood, exacerbating wildfires, increasing air pollution morbidity and mortality, as discussed in many published studies.

2. The claim that CO₂ enhances photosynthesis and makes oceans less alkaline. This claim pretends as if the small impacts mentioned are far more important than CO₂'s radiative impacts on climate and air pollution and on ocean life.

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On the causal link between carbon dioxide and air pollution mortality

Mark Z. Jacobson¹

Received 22 June 2007; revised 14 December 2007; accepted 3 January 2007; published 12 February 2008.

[1] Greenhouse gases and particle soot have been linked to enhanced sea-level, snowmelt, disease, heat stress, severe weather, and ocean acidification, but the effect of carbon dioxide (CO₂) on air pollution mortality has not been examined or quantified. Here, it is shown that increased water vapor and temperatures from higher CO₂ separately increase ozone more with higher ozone; thus, global warming may exacerbate ozone the most in already-polluted areas. A high-resolution global-regional model then found that CO₂ may increase U.S. annual air pollution deaths by about 1000 (350–1800) and cancers by 20–30 per 1 K rise in CO₂-induced temperature. About 40% of the additional deaths may be due to ozone and the rest, to particles, which increase due to CO₂-enhanced stability, humidity, and biogenic particle mass. An extrapolation by population could render 21,600 (7400–39,000) excess CO₂-caused annual pollution deaths worldwide, more than those from CO₂-enhanced storminess. **Citation:** Jacobson, M. Z. (2008), On the causal link between carbon dioxide and air pollution mortality, *Geophys. Res. Lett.*, 35, L03809, doi:10.1029/2007GL031101.

1. Introduction

[2] Because carbon dioxide's (CO₂'s) ambient mixing ratios are too low to affect human respiration directly, CO₂ has not been considered a classic air pollutant. Its effects on temperatures, though, affect meteorology, and both feed back to air pollution. Several studies have modeled the sensitivity of ozone to temperature [Sillman and Samson, 1995; Zhang *et al.*, 1998] and the regional or global effects of climate change from all greenhouse gases on ozone [Thompson *et al.*, 1989; Evans *et al.*, 1998; Dvortsov and Solomon, 2001; Mickley *et al.*, 2004; Stevenson *et al.*, 2005; Brasseur *et al.*, 2006; Murazaki and Hess, 2006; Steiner *et al.*, 2006; Racherla and Adams, 2006] and aerosol particles [Aw and Kleeman, 2003; Liao *et al.*, 2006; Unger *et al.*, 2006]. Some studies have highlighted the effect of water vapor on chemistry [Evans *et al.*, 1998; Dvortsov and Solomon, 2001; Stevenson *et al.*, 2005; Steiner *et al.*, 2006; Racherla and Adams, 2006; Aw and Kleeman, 2003]. However, none has isolated the effect of CO₂ alone on ozone, particles, or carcinogens, applied population and health data to the pollution changes, or examined the problem with a global-regional climate/air pollution model.

[3] Here, a box photochemistry calculation is first used to show how increases in water vapor and temperature inde-

pendently increase ozone more with high than low ozone. This analysis helps to explain the causal link between CO₂ and health in areas where most people live, as subsequently found in 3-D global-regional simulations.

2. Chemical Effects of CO₂ on Ozone

[4] The SMVGEAR II chemical solver was used first in box mode, without dilution or entrainment, to solve chemistry for 12 hours among 128 gases and 395 inorganic, organic, sulfur, chlorine, and bromine reactions (including 57 photoprocesses) (mostly given by Jacobson *et al.* [2007], also see the supplementary material of Jacobson [2007]). Cases with different initial NO_x and organic gas were run.

[5] Figure 1 shows the water-vapor (H₂O) and temperature-dependence of ozone under several ozone precursor combinations. For initial NO_x < 8 ppbv, ozone decreased with increasing H₂O. For initial NO_x > 80 ppbv and moderate initial NO_x with low organics, though, ozone increased with increasing H₂O, by up to 2.8 ppbv-O₃ per 1 pptv-H₂O. Between these extremes, ozone increased with increasing H₂O at low H₂O and stayed constant or slightly decreased at high H₂O (see the auxiliary material).¹ Figure 1 also shows that, generally (but not always), increasing water vapor increased ozone more with higher ozone.

[6] Further, the more ozone present, the more temperature-dependent chemistry increases ozone (Figure 1), consistent with Sillman and Samson [1995] and Zhang *et al.* [1998]. The ozone increase (Δχ, ppbv) per 1 K change in temperature (ΔT) from all points in Figure 1 were fit to

$$\Delta\chi/\Delta T = -0.13034 - 0.0045585\chi + 0.00028643\chi^2 - 4.6893 \times 10^{-7}\chi^3 \quad (1)$$

where χ is ozone (ppbv) at 298.15 K (32–250 ppbv). A 1 K rise increased ozone by about 0.1 ppbv at 40 ppbv but 6.7 ppbv at 200 ppbv. Olszyna *et al.* [1997] reported an observed correlation in the rural southeast U.S. of 2.4 ppbv ozone per 1 K. If temperature-dependent chemistry alone were causing this increase, ozone would need to be about 115 ppbv (equation 1) in that study, but it was 30–90 ppbv. Thus, other factors not accounted for in Equation 1, such as H₂O increases (described above) and biogenic gas emission increases [e.g., Guenther *et al.*, 1995], due to higher temperatures, may have caused the larger observed temperature-ozone correlation. Also, both temperature and ozone increase with sunlight, so all observed temperature-ozone correlations overestimate the magnitude of cause and effect.

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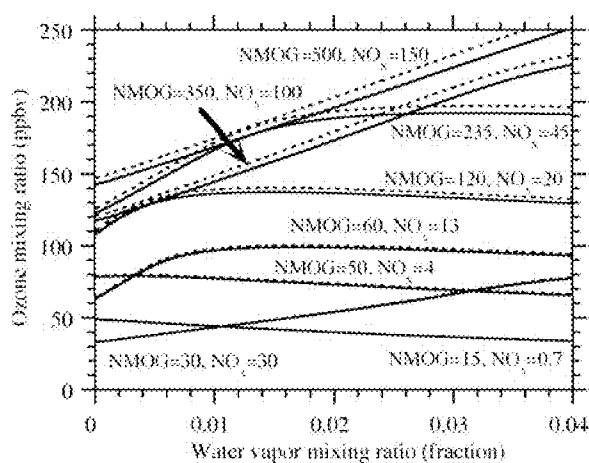


Figure 1. Mixing ratio of ozone and several other gases as a function of water vapor mixing ratio after 12 hours of a box-model chemistry-only simulation initialized at 0430 under several initial NO_x and nonmethane organic gas (NMOG) mixing ratio combinations (ppbv) (given in the figure) at 298.15 K (solid lines) and 299.15 K (dashed lines). The simulations assumed sinusoidally varying photolysis between 0600 and 1800.

3. Health Effects of CO_2 From Global-U.S. Simulations

[7] The chemistry used for Figure 1 was applied with emission, aerosol, cloud, meteorological, radiative, transport, and surface processes in the nested global-urban 3-D model, GATOR-GCMOM. The model (see auxiliary material) has been evaluated against U.S. gas, aerosol, meteorological, and radiative data extensively [e.g., Jacobson, 2001; Jacobson *et al.*, 2004, 2007; Colella *et al.*, 2005].

[8] Two global simulations ($4^\circ\text{-SN} \times 5^\circ\text{-WE}$) were run under present-day conditions. In the second, fossil-fuel CO_2 (fCO_2) ambient mixing ratios and emissions were set to preindustrial values. When U.S. temperatures were about 1 K higher in the present minus preindustrial- CO_2 global simulations, the U.S. regional domain ($0.5^\circ\text{S-N} \times 0.75^\circ\text{W-E}$) in each global simulation was turned on and initialized with global-domain data (including ambient CO_2). Global and regional domains were run another four months. Emissions of fCO_2 were included in the present-day but not preindustrial- CO_2 global- and U.S.-domain simulations.

[9] Figures 2 and S3 show differences between the present-day and preindustrial- CO_2 simulations. Figure 2a compares modeled with radiosonde (1958–2006) vertical temperature differences. The population-weighted near-surface temperature increase over land was 1.07 K (Table S4), which increased population-weighted H_2O by 1.28 ppthv (Table S4) and U.S.-averaged H_2O by 1.1 ppthv (Figure 2b). The observed 1961–1995 U.S. water vapor increase and positive correlation between temperature and H_2O [Gaffen and Ross, 1999] support the modeled H_2O increase with increasing temperatures.

[10] Figure 2c indicates that fCO_2 increased ozone by 0.12 ppbv in the U.S., 5 ppbv in Los Angeles, 1–5 ppbv in the southeast, and up to 2 ppbv along the northeast coast. In Los Angeles, the 0.75 K temperature increase (Figure 2a) and 1.3 ppthv water vapor increase increased ozone through chemistry (Figure 1).

[11] In the southeast, 0.5–1 K temperature increases increased isoprene and monoterpenes (Figure S3a), reducing the relative humidity (Figure S3c) and cloud optical depth (Figure S3d), increasing ultraviolet radiation (Figure S3e), and enhancing ozone. The 0.5–2 ppbv/K ozone increase in Tennessee is just below the correlated estimate of 2.4 ppbv/K from Olszyna *et al.* [1997] as expected (section 2). Averaged over the U.S. domain, higher temperatures from fCO_2 increased biogenic soil NO_x , isoprene, monoterpene, and other organic carbon emissions by 6% (0.01 Tg/yr), 9% (0.47), 9.8% (0.15), and 8.9% (0.14), respectively. In the northeast, higher ozone due to higher temperatures was offset partly by higher cloud optical depth (Figure S3d) and lower ultraviolet radiation (Figure S3e), modestly increasing ozone.

[12] The population-weighted 8-hr ozone increase due to fCO_2 was +0.72 ppbv (Table 1), suggesting a greater increase over populated than less-populated areas. FCO_2 increased particles in populated areas (Tables 1 and S4) by warming the air more than the ground, increasing stability (as with radiosonde data-Figure 2a, ii), decreasing turbulence, shearing stress, and surface wind speed (Table S4 and Figure S3), reducing dispersion. Reduced dispersion and wind speed are consistent with Mickley *et al.* [2004] who correlated warmer temperatures with reduced cyclone activity. FCO_2 also increased isoprene and monoterpene emissions, thus secondary organic matter (SOM) (Table S4, Figures S3a and S3b); and increased relative humidity (Table S4) by increasing H_2O , swelling aerosol particles, increasing nitric acid and ammonia dissolution and the surface area for sulfuric acid and organic condensation. FCO_2 increased land precipitation, consistent in direction with observed trends [Intergovernmental Panel on Climate Change, 2001], increasing aerosol removal, but less than other processes increased aerosol concentrations.

[13] Health effect changes (Δy) due to ozone and $\text{PM}_{2.5}$ changes in each model cell were determined from [e.g., Ostro *et al.*, 2006],

$$\Delta y = (1 - \exp[-\beta \Delta x]) y_0 P \quad (2)$$

where Δx is the simulation-averaged mixing ratio or concentration change in the cell, β is the fractional increase in risk per unit Δx , y_0 is the baseline health effect rate, and P is the cell population exposed to at least a minimum threshold. Table 1 and its footnote provide values of P , Δx , β , y_0 , and thresholds. Changes were summed over all cells and adjusted from a four-month to an annual average (Table 1, footnote).

[14] With this method, mortality increases due to modeled ozone and $\text{PM}_{2.5}$ from fCO_2 were 415 (207–620)/yr and 640 (160–1280)/yr, respectively, per 1.07 K (Table 1) or a total of near 1000 (350–1800) per 1.00 K (a 1.1% increase relative to the baseline death rate - Table 1), with about 40% due to ozone. A simple extrapolation from U.S. to world population (301.5 to 6600 million) gives 21,600 (7400–39,000) deaths/yr worldwide per 1 K due to fCO_2 above the baseline air pollution death rate (2.2 million/yr). The ozone portion of this (8,500 deaths/yr) is conservative compared with 15,500 deaths/yr, calculated from West *et al.* [2006] (= 30,000 deaths/yr from 1 ppbv ozone multiplied by the 2006:2030 population ratio (66:92) and the ozone

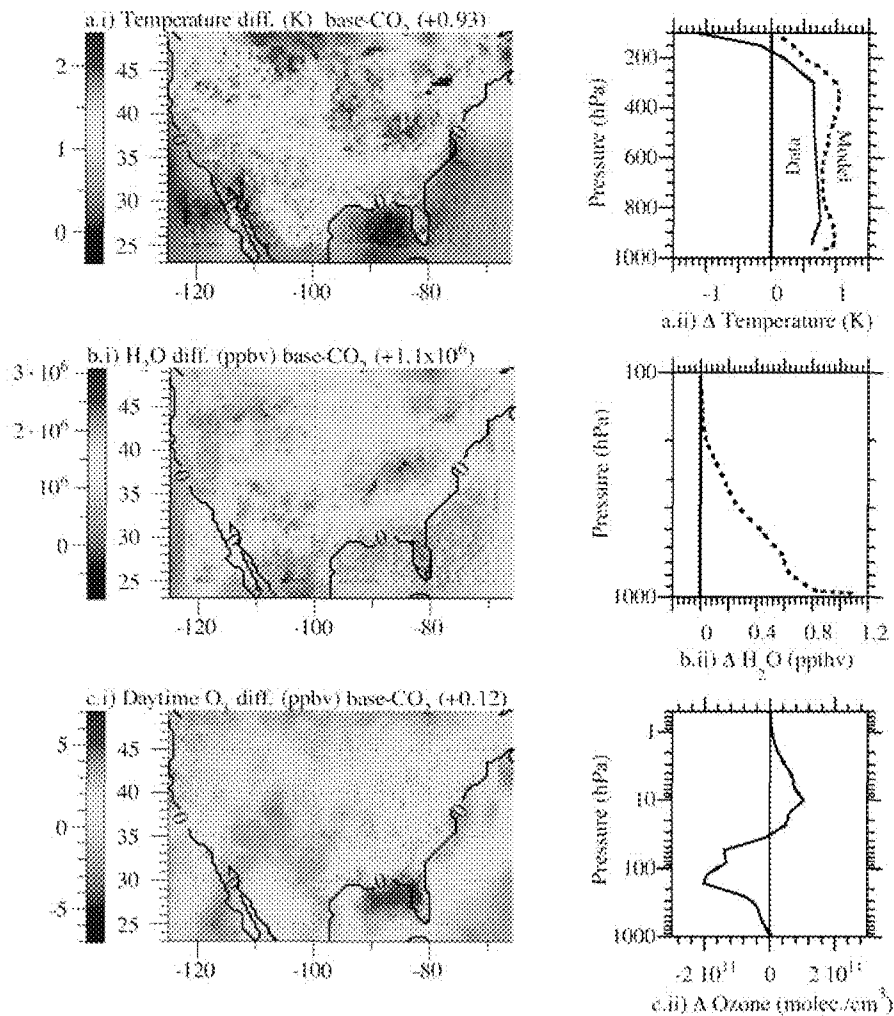


Figure 2. Four-month (mid-July to mid-November) domain-averaged near-surface and vertical-profile differences in (a) temperature, (b) water vapor, and (c) ozone between the present-day and preindustrial- CO_2 simulations. The domain-averaged (over land and water) change for each surface plot is given in parentheses. Also shown in Figure 2a (ii) is the 1958–2006 globally-averaged radiosonde temperature change [Thorne *et al.*, 2005], which is for reference only since the present simulations isolate the effects of CO_2 and do not examine all forcing agents.

change ratio (0.72:1.0). Remaining differences may be due to different thresholds used (35 ppbv here vs. 25 ppbv).

[15] One estimate of severe weather-related fatalities worldwide in the 1990s was 33,000/yr (Worldwatch Institute, *Unnatural disaster: The lesson of Katrina*, available at www.worldwatch.org/node/1822, 2005). A 1 K rise will increase this number, but less than 23,000/yr given that hurricane and tornado deaths have declined due to better warning systems (e.g., the deadliest hurricane since 1910 was over 30 years ago – Honduras, 1974, 10,000 deaths). Global warming will increase heat stress- and disease-related deaths as well, but by uncertain rates [e.g., Medina-Ramon and Schwartz, 2007].

[16] FCO_2 increased carcinogens, but the increase was small. Isoprene increases due to higher temperatures increased formaldehyde and acetaldehyde. Reduced dispersion increased exposure to these carcinogens and benzene and 1,3-butadiene.

[17] These simulations treated temperature effects on natural emissions but not power plant or vehicle emissions.

A sensitivity test was run examining the impact of 1 K on power plant energy demand and emissions. The resulting ozone (Figure S4) may cause 80 more U.S. deaths/yr. However, warmer winter temperatures will also decrease natural gas and vehicle emissions, and warmer summers will increase vehicle emissions [Rubin *et al.*, 2006; N. Motallebi *et al.*, manuscript in review, 2007]. The feedbacks of temperature to anthropogenic emissions must be studied more but are expected to be smaller than the other feedbacks examined here. Further uncertainties arise from model resolution, current and future emissions, numerical treatments, health data, and extrapolation of four-month results to a year, as detailed in the auxiliary material.

4. Effects of CO_2 on Stratospheric Ozone and UV Radiation

[18] Whereas, fCO_2 warms the surface and troposphere, it cools the stratosphere (Figure 2a, ii). Measurements indicate a 1%/yr (0.45 ppmv/decade) stratospheric water vapor

Table 1. Summary of CO₂'s Effects on Cancer, Ozone Mortality, Ozone Hospitalization, Ozone Emergency Room Visits, and Particulate-Matter Mortality^a

	Base	Base Minus No fCO ₂
Carcinogens		
Formaldehyde (ppbv)	3.61	+0.22
Acetaldehyde (ppbv)	2.28	+0.203
1,3-Butadiene (ppbv)	0.254	+0.00823
Benzene (ppbv)	0.479	+0.0207
USEPA cancers/yr ^b	389	+23
OEHHA cancers/yr ^b	789	+33
Ozone		
8-hr ozone (ppbv) in areas ≥ 35 ppbv ^c	42.3	+0.724
Pop (mil.) exposed in areas ≥ 35 ppbv ^d	184.8	184.8
High ozone deaths/yr ^e	6230	620
Med. ozone deaths/yr ^e	4160	+415
Low ozone deaths/yr ^e	2080	+207
Ozone hospitalizations/yr ^e	24,100	+2400
Ozone ER visits/yr ^e	21,500	+2160
Particulate matter		
PM _{2.5} ($\mu\text{g}/\text{m}^3$) in areas $> 0 \mu\text{g}/\text{m}^3$ ^f	16.1	+0.065
Pop (mil.) exposed in areas $\geq 0 \mu\text{g}/\text{m}^3$	301.5	301.5
High PM _{2.5} deaths/yr ^g	191,000	+1280
Medium PM _{2.5} deaths/yr ^g	97,000	+640
Low PM _{2.5} deaths/yr ^g	24,500	+160

^aResults are shown for the present-day ("Base") and present-day minus preindustrial ("no-fCO₂") 3-D simulations. All mixing ratios and concentrations are near-surface values averaged over four months (mid-July to mid-November) and weighted by population (population-weighted value is defined in the footnote to Table S4). Divide the last column by 1.07 K (the population-weighted CO₂-induced temperature change from Table S4) to obtain the health effect per 1 K.

^bUSEPA and OEHHA cancers/yr were found by summing the product of individual CUREs (cancer unit risk estimates = increased 70-year cancer risk per $\mu\text{g}/\text{m}^3$ sustained concentration change) by the population-weighted mixing ratio or mixing ratio difference of a carcinogen, by the population, and air density, over all carcinogens, then dividing by 70 yr. USEPA CUREs are 1.3×10^{-5} (formaldehyde), 2.2×10^{-6} (acetaldehyde), 3.0×10^{-5} (butadiene), 5.0×10^{-6} (= average of 2.2×10^{-6} and 7.8×10^{-6}) (benzene) (www.epa.gov/IRIS/). OEHHA CUREs are 6.0×10^{-6} (formaldehyde), 2.7×10^{-6} (acetaldehyde), 1.7×10^{-4} (butadiene), 2.9×10^{-5} (benzene) (www.oehha.ca.gov/risk/ChemicalDB/index.asp).

^c8-hr ozone ≥ 35 ppbv is the highest 8-hour-averaged ozone during each day, averaged over all days of the four-month simulation in areas where this value ≥ 35 ppbv in the base case. When base O₃ ≥ 35 ppbv and no-fCO₂ O₃ < 35 ppbv, the mixing ratio difference was base O₃ minus 35 ppbv.

^dThe 2007 population exposed to ≥ 35 ppbv O₃ is the population exposed to a four-month-averaged 8-hour averaged ozone mixing ratio above 35 ppbv and was determined from the base case.

^eHigh, medium, and low deaths/yr, hospitalizations/yr, and emergency-room (ER) visits/yr due to short-term O₃ exposure were obtained from Equation 2 applied to each model cell, summed over all cells. The baseline 2003 U.S. death rate (y₀) was 833 deaths/yr per 100,000 [Hoyert et al., 2006]. The baseline 2002 hospitalization rate due to respiratory problems was 1189 per 100,000 [Merrill and Elixhauser, 2005]. The baseline 1999 all-age emergency-room visit rate for asthma was 732 per 100,000 [Mannino et al., 2002]. These rates were assumed to be the same in each U.S. county, although they vary slightly by county. The fraction increases (β) in the number of deaths from all causes due to ozone were 0.006, 0.004, and 0.002 per 10 ppbv increase in daily 1-hr maximum ozone [Ostro et al., 2006]. These were multiplied by 1.33 to convert the risk associated with 10 ppbv increase in 1-hr maximum O₃ to that associated with a 10 ppbv increase in 8-hour average O₃ [Thurston and Ito, 2001]. The central value of the increased risk of hospitalization due to respiratory disease was 1.65% per 10 ppbv increase in 1-hour maximum O₃ (2.19% per 10 ppbv increase in 8-hour average O₃), and that for all-age ER visits for asthma was 2.4% per 10 ppbv increase in 1-hour O₃ [Ostro et al., 2006] (3.2% per 10 ppbv increase in 8-hour O₃). All values were reduced by 45% to account for the mid-July to mid-November and year-around O₃ ≥ 35 ppbv ratio, obtained from detailed observations (H. Tran, personal communication, 2007).

^fThis is the simulated 24-hr PM_{2.5}, averaged over four months, in locations where PM_{2.5} $\geq 0 \mu\text{g}/\text{m}^3$.

^gThe death rate due to long-term PM_{2.5} exposure was calculated from Equation 2. Pope et al. [2002] provide increased death risks to those ≥ 30 years of 0.008 (high), 0.004 (medium), and 0.001 (low) per 1 $\mu\text{g}/\text{m}^3$ PM_{2.5} $> 8 \mu\text{g}/\text{m}^3$ based on 1979–1983 data. From 0–8 $\mu\text{g}/\text{m}^3$, the increased risks were conservatively but arbitrarily assumed = $1/4$ those $> 8 \mu\text{g}/\text{m}^3$ to account for reduced risk near zero PM_{2.5}. Assuming a higher risk would strengthen the conclusion found here. The all-cause 2003 U.S. death rate of those ≥ 30 years was 809.7 deaths/yr per 100,000 total population. No scaling of results from the 4-month model period to the annual average was performed to be conservative, since PM_{2.5} concentrations from July–November are lower than in the annual average based on California data (H. Tran, personal communication, 2007).

increase from 1954–2000 [Rosenlof et al., 2001], but a slight lower-stratospheric decrease from 2001–2005 [Randel et al., 2006]. The simulations here, which accounted for chlorine and bromine gas and heterogeneous chemistry, found that the temperature and H₂O changes due to fCO₂ increased middle and upper-stratospheric ozone but decreased upper tropospheric and lower stratospheric (UTLS) ozone, where its column abundance is greater, causing a net U.S. column ozone loss of 2.7% (Figure 2c, ii, and Table S4). The UTLS ozone losses were due to increases in H₂O there (Figure 2b, ii), as indicated by Figure S2b and Dvortsov and Solomon [2001]. The upper- and middle-stratospheric gains can be explained by Figure S1, which shows that, at 25 km, stratospheric ozone decreases by 1.5% as H₂O increases by 1 ppmv. As temperature

decreases by 1.5 K, though, ozone increases by 3.6%, suggesting an overall ozone increase from H₂O and cooling. The ozone increase upon stratospheric cooling is due to reduced loss from O+O₃ [Evans et al., 1998]. Despite the column ozone loss due to fCO₂, surface UV hardly changed (Table S4) because fCO₂ increased cloud optical depth, offsetting UV increases from ozone loss.

5. Summary

[19] A climate-air pollution model showed by cause and effect that fossil-fuel CO₂ increases increase U.S. surface ozone, carcinogens, and particulate matter, thereby increasing death, asthma, hospitalization, and cancer rates. Increased water vapor and temperatures due to higher CO₂

each increase ozone increasingly with increasing ozone. At low ozone, more water vapor decreases ozone slightly but higher temperatures increase biogenic emission in many areas, offsetting ozone decreases in such areas. CO₂ increases stability, the relative humidity, and biogenic particle mass thus PM_{2.5}. Finally, CO₂ decreases column ozone over the U.S. by increasing upper tropospheric/lower stratospheric water vapor.

[20] **Acknowledgments.** NASA grants NNG04GE93G and NNG04GJ89G and U.S. Environmental Protection Agency grant RD-83337101-O. I thank Hien Tran of the California Air Resources Board for helpful health statistic comments.

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Enhancement of Local Air Pollution by Urban CO₂ Domes

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Received October 3, 2009. Revised manuscript received December 21, 2009. Accepted March 2, 2010.

Data suggest that domes of high CO₂ levels form over cities. Despite our knowledge of these domes for over a decade, no study has contemplated their effects on air pollution or health. In fact, all air pollution regulations worldwide assume arbitrarily that such domes have no local health impact, and carbon policy proposals, such as “cap and trade”, implicitly assume that CO₂ impacts are the same regardless of where emissions occur. Here, it is found through data-evaluated numerical modeling with telescoping domains from the globe to the U.S., California, and Los Angeles, that local CO₂ emissions in isolation may increase local ozone and particulate matter. Although health impacts of such changes are uncertain, they are of concern, and it is estimated that that local CO₂ emissions may increase premature mortality by 50–100 and 300–1000/yr in California and the U.S., respectively. As such, reducing locally emitted CO₂ may reduce local air pollution mortality even if CO₂ in adjacent regions is not controlled. If correct, this result contradicts the basis for air pollution regulations worldwide, none of which considers controlling local CO₂ based on its local health impacts. It also suggests that a “cap and trade” policy should consider the location of CO₂ emissions, as the underlying assumption of the policy is incorrect.

Introduction

Although CO₂ is generally well-mixed in the atmosphere, data indicate that its mixing ratios are higher in urban than in background air, resulting in *urban CO₂ domes* (1–6). Measurements in Phoenix, for example, indicate that peak and mean CO₂ in the city center were 75% and 38–43% higher, respectively, than in surrounding rural areas (2). Recent studies have examined the impact of global greenhouse gases on air pollution (7–13). Whereas one study used a 1-D model to estimate the temperature profile impact of a CO₂ dome (3), no study has isolated the impact of locally emitted CO₂ on air pollution or health. One reason is that model simulations of such an effect require treatment of meteorological feedbacks to gas, aerosol, and cloud changes, and few models include such feedbacks in detail. Second, local CO₂ emissions are close to the ground, where the temperature contrast between the Earth’s surface and the lowest CO₂ layers is small. However, studies have not considered that CO₂ domes result in CO₂ gradients high above the surface. If locally emitted CO₂ increases local air pollution, then cities, counties, states, and small countries can reduce air pollution health problems by reducing their own CO₂ emissions, regardless of whether other air pollutants are reduced locally or whether other locations reduce CO₂.

Methodology and Evaluation

For this study, the nested global-through-urban 3-D model, GATOR-GCMOM (13–17) was used to examine the effects of locally emitted CO₂ on local climate and air pollution. A nested model is one that telescopes from a large scale to more finely resolved domains. The model and its feedbacks are described in the Supporting Information. Example CO₂ feedbacks treated include those to heating rates thus temperatures, which affect (a) local temperature and pressure gradients, stability, wind speeds, cloudiness, and gas/particle transport, (b) water evaporation rates, (c) the relative humidity and particle swelling, and (d) temperature-dependent natural emissions, air chemistry, and particle microphysics. Changes in CO₂ also affect (e) photosynthesis and respiration rates, (f) dissolution and evaporation rates of CO₂ into the ocean, (g) weathering rates, (h) ocean pH and chemical composition, (i) sea spray pH and composition, and (j) rainwater pH and composition. Changes in sea spray composition, in turn, affect sea spray radiative properties, thus heating rates.

The model was nested from the globe (resolution 4°SN×5°WE) to the U.S. (0.5°×0.75°), California (0.20°×0.15°), and Los Angeles (0.045°×0.05°). The global domain included 47 sigma-pressure layers up to 0.22 hPa (~60 km), with high resolution (15 layers) in the bottom 1 km. The nested regional domains included 35 layers exactly matching the global layers up to 65 hPa (~18 km). The model was initialized with 1-degree global reanalysis data (18) but run without data assimilation or model spinup.

Three original pairs of baseline and sensitivity simulations were run: one pair nested from the globe to California for one year (2006), one pair nested from the globe to California to Los Angeles for two sets of three months (Feb–Apr, Aug–Oct, 2006), and one pair nested from the globe to the U.S. for two sets of three months (Jan–Mar, Jul–Sep, 2006). The seasonal periods were selected to obtain roughly winter/summer results that could be averaged to estimate annual values. A second 1-year (2007) simulation pair was run for California to test interannual variability. In each sensitivity simulation, only anthropogenic CO₂ emissions (emCO₂) were removed from the finest domain. Initial ambient CO₂ was the same in all domains of both simulations, and emCO₂ was the same in the parent domains of both. As such, all resulting differences were due solely to initial changes in locally emitted (in the finest domain) CO₂.

The model and comparisons with data have been described in over 50 papers, including recently (13–17). Figure 1 further compares modeled O₃, PM₁₀, and CH₃CHO from August 1–7 of the baseline (with emCO₂) and sensitivity (no emCO₂) simulations from the Los Angeles domain with data. The comparisons indicate good agreement for ozone in particular. Since emCO₂ was the only variable that differed initially between simulations, it was the initiating causal factor in the increases in O₃, PM₁₀, and CH₃CHO seen in Figure 1. Although ozone was predicted slightly better in the no-emCO₂ case than in the emCO₂ case during some hours, modeled ozone in the emCO₂ case matched peaks better by about 0.5% averaged over comparisons with all data shown and not shown.

Results

Figure 2a,b shows the modeled contribution of California’s CO₂ emissions to surface and column CO₂, respectively, averaged over a year. The CO₂ domes over Los Angeles, the San Francisco Bay Area, Sacramento (38.58 N, 121.49 W),

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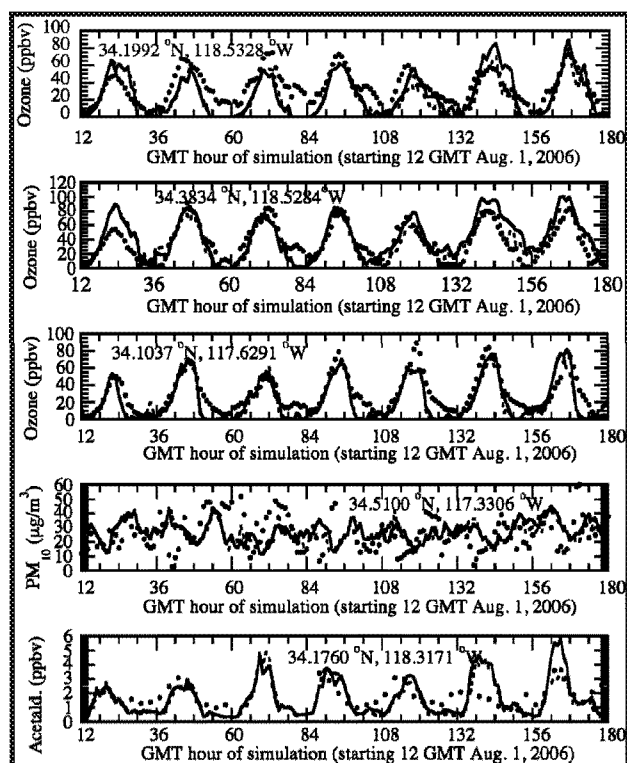


FIGURE 1. Paired-in-time-and-space comparisons of modeled baseline (solid lines), modeled no-emCO₂ (dashed lines), and data (22) (dots) for ozone, sub-10-µm particle mass, and acetaldehyde from the Los Angeles domain for August 1–7, 2006 of the Aug-Oct 2006 simulation. Local standard time is GMT minus 8 h.

and the Southern Central Valley are evident. The largest surface CO₂ increase (5%, or 17.5 ppmv) was lower than observed increases in cities (2) since the resolution of the California domain was coarser than the resolution of measurements. As shown below for Los Angeles, an increase in model resolution increases the magnitude of the surface and column CO₂ dome.

Population-weighted (PW) and domain-averaged (DA) changes in several parameters can help to elucidate the effects of the CO₂ domes. A PW value is the product of a parameter value and population in a grid cell, summed over all grid cells, all divided by the summed population among all cells. Thus, a PW value indicates changes primarily in populated areas, whereas a DA value indicates changes everywhere, independent of population. The PW and DA increases in surface CO₂ due to emCO₂ were 7.4 ppmv and 1.3 ppmv, respectively, but the corresponding increases in column CO₂ were 6.0 g/m² and 1.53 g/m², respectively, indicating, along with Figure 2a,b, that changes in column CO₂ were spread horizontally more than were changes in surface CO₂. This is because surface winds are usually slower than winds aloft, so only when surface CO₂ mixes vertically is it transported much horizontally, and when that occurs, surface CO₂ is quickly replenished with new emissions.

The CO₂ increases in California increased the PW air temperature by about 0.0063 K, more than it changed the domain-averaged air temperature (+0.00046) (Figure 2c). Thus, CO₂ domes had greater temperature impacts where the CO₂ was emitted and where people lived than in the domain average. This result held for the effects of emCO₂ on column water vapor (Figure 2d - PW: +4.3 g/m²; DA: +0.88 g/m²), ozone (Figure 2e - PW: +0.06 ppbv; DA: +0.0043 ppbv), PM_{2.5} (Figure 2g - PW: +0.08 µg/m³; DA: -0.0052 µg/m³), and PAN (Figure 2i - PW: +0.002 ppbv;

DA: -0.000005 ppbv). The peak surface air temperature increases in Figure 2c (and in the Los Angeles simulations) were ~0.1 K, similar to those found from 1-D radiative only calculations for Phoenix (3). Peak ozone and its health effects occurred over Los Angeles and Sacramento (Figure 2e,f), where increases in CO₂ (Figure 2a), temperature (although small for Sacramento, Figure 2c), and column H₂O (Figure 2d) occurred.

Figure 3 elucidates spatial correlations between annually averaged changes in local ambient CO₂ caused by emCO₂ and changes in other parameters. Increases in temperature, water vapor, and ozone correlated positively and with statistical significance ($p < 0.05$) with increases in CO₂. Ozone increases also correlated positively and with strong significance with increases in water vapor and temperature. A previous study found that increases in temperature and water vapor both increase ozone at high ozone but cause little change in ozone at low ozone (13), consistent with this result.

PM_{2.5} correlated slightly negatively ($r = 0.017$) but without statistical significance, with higher temperature and much more positively ($r = 0.23$) and with strong significance ($p < 0.0001$) with higher water vapor in California. Higher temperature decreased PM_{2.5} by increasing vapor pressures thus PM evaporation and by enhancing precipitation in some locations. Some PM_{2.5} decreases with higher temperature were offset by biogenic organic emission increases with higher temperatures followed by biogenic oxidation to organic PM. But, in populated areas of California, biogenic emissions are relatively low. Some PM_{2.5} decreases were also offset by surface PM_{2.5} increases caused by slower surface winds due to enhanced boundary-layer stability from CO₂, which reduced the downward transport of fast winds aloft to the surface (13). While higher temperature slightly decreased PM_{2.5}, higher water vapor due to emCO₂ increased PM_{2.5} by increasing aerosol water content, increasing nitric acid and ammonia gas dissolution, forming more particle nitrate and ammonium. Higher ozone from higher water vapor also increased oxidation of organic gases to organic PM. Overall, PM_{2.5} increased with increasing CO₂, but because of the opposing effects of temperature and water vapor on PM_{2.5}, the net positive correlation was weak ($r = 0.022$) and not statistically significant ($p = 0.17$). However, when all CO₂ increases below 1 ppmv were removed, the correlation improved substantially ($r = 0.047$, $p = 0.07$). Further, the correlation was strongly statistically significant for Los Angeles and U.S. domains, as discussed shortly.

Health effect rates (y) due to pollutants in each model domain for each simulation were determined from

$$y = y_0 \sum_i \left\{ P_i \sum_t (1 - \exp[-\beta \times \max(x_{i,t} - x_{th}, 0)]) \right\} \quad (1)$$

where $x_{i,t}$ is the concentration in grid cell i at time t , x_{th} is the threshold concentration below which no health effect occurs, β is the fractional increase in risk per unit x , y_0 is the baseline health effect rate, and P_i is the grid cell population. Table 1 provides sums or values of P , β , y_0 , and x_{th} . Differences in health effects between two simulations were obtained by differencing the aggregated effects from each simulation determined from eq 1. The relationship between ozone exposure and premature mortality is uncertain; however, ref 19 suggests that it is “highly unlikely” to be zero. Similarly, ref 20 suggests that the exact relationship between PM_{2.5} exposure and mortality is uncertain but “likely causal”. Cardiovascular effects of PM_{2.5} are more strongly “causal”. Although health effects of PM_{2.5} differ for different chemical components within PM_{2.5}, almost all epidemiological studies

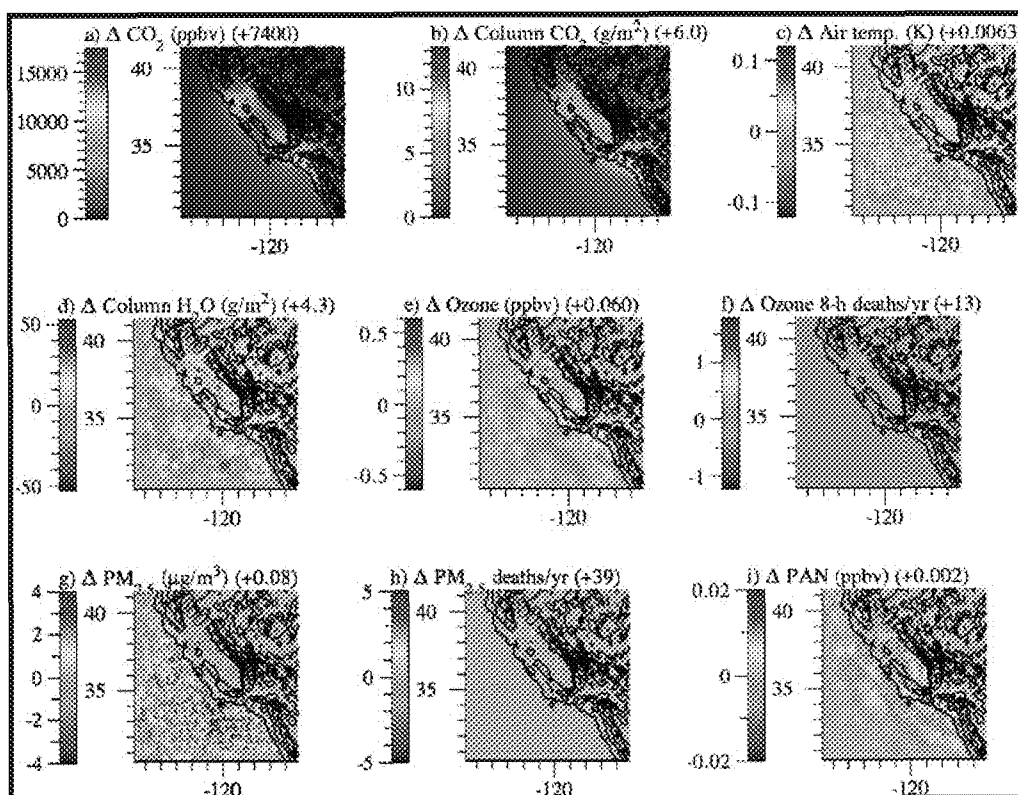


FIGURE 2. Modeled annually averaged difference for several surface or column (if indicated) parameters in California, parts of Nevada, and parts of New Mexico when two simulations (with and without emCO_2) were run. The numbers in parentheses are average population-weighted changes for the domain shown.

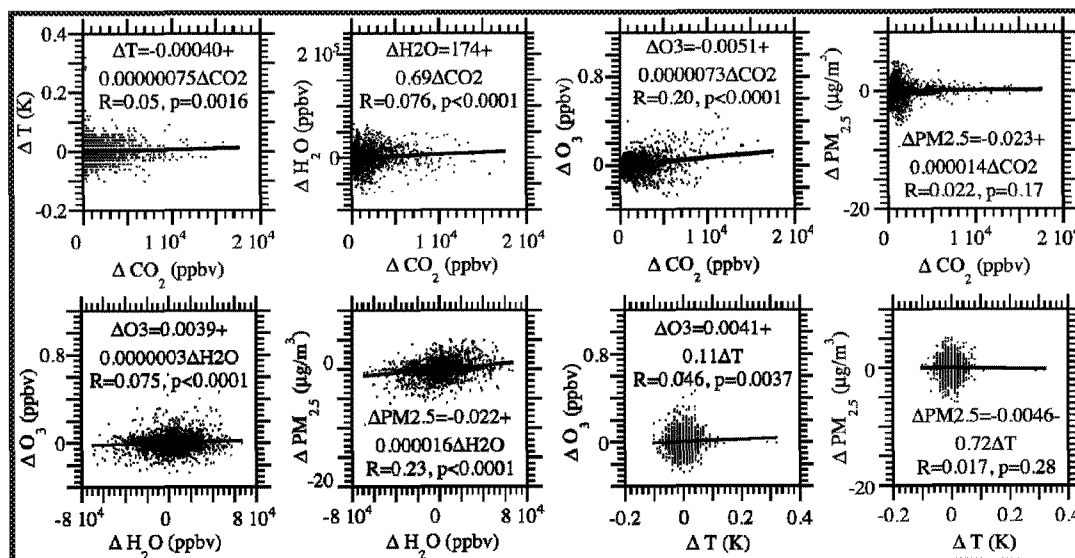


FIGURE 3. Scatter plots of paired-in-space one-year-averaged changes between several parameter pairs, obtained from all near-surface grid cells of the California domain. Also shown is an equation for the linear fit through the data points in each case and the r and p values for the fits. The equation describes correlation only, not cause and effect, between each parameter pair.

correlating particle changes with health use ambient $\text{PM}_{2.5}$ measurements to derive such correlations. For consistency, it is therefore necessary to apply β values from such studies to modeled $\text{PM}_{2.5}$ (22).

California's local CO_2 resulted here in ~ 13 (with a range of 6–19 due to uncertainty in epidemiological data) additional ozone-related premature mortalities/year (Figure 2f) or 0.3% above the baseline 4600 (2300–6900)/year (Table 1). Higher $\text{PM}_{2.5}$ due to emCO_2 contributed another ~ 39 (13–60) premature mortalities/year (Figure 2h), 0.2%

above the baseline rate of 22,500 (5900–42,000)/year. Changes in cancer due to emCO_2 were relatively small (Table 1). Additional uncertainty arises due to the model itself and interannual variations in concentration. Some of the model uncertainties are elucidated in comparisons with data, such as in Figure 1; however, it is difficult to translate such uncertainty into mortality uncertainty. Interannual variations in concentrations were examined by running a second pair of simulations for California, starting one year after the first. The results of this simulation

TABLE 1. Summary of Locally-Emitted CO₂'s (emCO₂) Effects on Cancer, Ozone Mortality, Ozone Hospitalization, Ozone Emergency-Room (ER) Visits, and Particulate-Matter Mortality in California (CA), Los Angeles (LA), and the United States (U.S.)^d

	annual base CA	base minus no emCO ₂ CA	annual base LA	base minus no emCO ₂ LA	annual base U.S.	base minus no emCO ₂ U.S.
ozone ≥ 35 ppbv (ppbv)	47.4	+0.060	44.7	+0.12	47.0	+0.044
PM _{2.5} (μg/m ³) (pop-weight)	50.0	+0.08	36	+0.29	64.4	+0.041
PM _{2.5} (μg/m ³) (all land)	21.5	-0.007	25.8	+0.06	32.8	+0.039
formaldehyde (ppbv)	4.43	+0.0030	4.1	+0.054	6.75	+0.066
acetaldehyde (ppbv)	1.35	+0.0017	1.3	+0.021	2.45	+0.016
1,3-butadiene (ppbv)	0.11	-0.00024	0.23	+0.0020	0.077	+0.0005
benzene (ppbv)	0.30	-0.00009	0.37	+0.0041	0.34	+0.020
Cancer						
USEPA cancers/yr ^a	44.1	0.016	22.0	+0.28	573	+6.9
OEHHA cancers/yr ^a	54.4	-0.038	37.8	+0.39	561	+11.8
Ozone Health Effects						
high O ₃ mortalities/yr ^b	6860	+19	2140	+20	52,300	+245
med. O ₃ mortalities/yr ^b	4600	+13	1430	+14	35,100	+166
low O ₃ mortalities/yr ^b	2300	+6	718	+7	17,620	+85
O ₃ hospitalizations/yr ^b	26,300	+65	8270	+75	200,000	+867
ozone ER visits/yr ^b	23,200	+56	7320	+66	175,000	+721
PM Health Effects						
high PM _{2.5} mortalities/yr ^c	42,000	+60	16,220	+147	44,800	+810
med. PM _{2.5} mortalities/yr ^c	22,500	+39	8500	+81	169,000	+607
low PM _{2.5} mortalities/yr ^c	5900	+13	2200	+22	316,000	+201

^a USEPA (U.S. Environmental Protection Agency) and OEHHA (Office of Environmental Health Hazard Assessment) cancers/yr were found by summing, over all model surface grid cells and the four carcinogens (formaldehyde, acetaldehyde, 1,3-butadiene, and benzene), the product of individual CUREs (cancer unit risk estimates=increased 70-year cancer risk per μg/m³ sustained concentration change), the mass concentration (μg/m³) (for baseline statistics) or mass concentration difference (for difference statistics) of the carcinogen, and the population in the cell and then dividing by the population of the model domain and by 70 yr. USEPA CUREs were 1.3×10^{-5} (formaldehyde), 2.2×10^{-6} (acetaldehyde), 3.0×10^{-5} (butadiene), 5.0×10^{-6} (=average of 2.2×10^{-6} and 7.8×10^{-6}) (benzene) (www.epa.gov/IRIS/). OEHHA CUREs were 6.0×10^{-6} (formaldehyde), 2.7×10^{-6} (acetaldehyde), 1.7×10^{-4} (butadiene), 2.9×10^{-5} (benzene) (www.oehha.ca.gov/risk/ChemicalDB/index.asp). ^b High, medium, and low mortalities/yr, hospitalizations/yr, and emergency-room (ER) visits/yr due to short-term O₃ exposure were obtained from eq 1, assuming a threshold (x_{th}) of 35 ppbv (23). The baseline 2003 U.S. mortality rate (y_0) was 833 mortalities/yr per 100,000 (24). The baseline 2002 hospitalization rate due to respiratory problems was 1189 per 100,000 (25). The baseline 1999 all-age emergency-room visit rate for asthma was 732 per 100,000 (26). The fractional increases (β) in the number of premature mortalities from all causes due to ozone were 0.006, 0.004, and 0.002 per 10 ppbv increase in daily 1-h maximum ozone (27). These were multiplied by 1.33 to convert the risk associated with a 10 ppbv increase in 1-h maximum O₃ to that associated with a 10 ppbv increase in 8-h average O₃ (23). The central value of the increased risk of hospitalization due to respiratory disease was 1.65% per 10 ppbv increase in 1-h maximum O₃ (2.19% per 10 ppbv increase in 8-h average O₃), and that for all-age ER visits for asthma was 2.4% per 10 ppbv increase in 1-h O₃ (3.2% per 10 ppbv increase in 8-h O₃) (25, 26). ^c The mortality rate due to long-term PM_{2.5} exposure was calculated from eq 1. Increased premature mortality risks to those ≥30 years were 0.008 (high), 0.004 (medium), and 0.001 (low) per 1 μg/m³ PM_{2.5} > 8 μg/m³ based on 1979–1983 data (28). From 0–8 μg/m³, the increased risks were assumed to be a quarter of the risks for those >8 μg/m³ to account for reduced risk near zero PM_{2.5} (13). The all-cause 2003 U.S. mortality rate of those ≥30 years was 809.7 mortalities/yr per 100,000 total population. Reference 29 provides higher relative risks of PM_{2.5} health effects data; however, the values from ref 28 were retained to be conservative. ^d Results are shown for the with-emCO₂ emissions simulation ("base") and the difference between the base and no emCO₂ emissions simulations ("base minus no-emCO₂") for each case. The domain summed populations (sum of P_i in eq 1) in the CA, LA, and U.S. domains were 35.35 million, 17.268 million, and 324.07 million, respectively. All concentrations except the second PM_{2.5}, which is an all-land average, were near-surface values weighted spatially by population. PM_{2.5} concentrations in the table include liquid water, but PM_{2.5} used for health calculations were dry. CA results were for an entire year, LA results were an average of Feb-Apr and Aug-Oct (Figure 4), and U.S. results were an average of Jan-Mar and Jul-Sep.

were similar to those for the first, with ~51 (17–82) additional ozone- plus PM_{2.5}-related premature mortalities/year attributable to emCO₂.

Simulations for Los Angeles echo results for California but allowed for a more resolved picture of the effects of emCO₂. Figure 4a (Feb-Apr) indicates that the near-surface CO₂ dome that formed over Los Angeles peaked at about 34 ppmv, twice that over the coarser California domain. The column difference (Figure 4b) indicates a spreading of the dome over a larger area than the surface dome. In Feb-Apr and Aug-Oct, emCO₂ enhanced PW ozone and PM_{2.5}, increasing mortality (Figure 4, Table 1) and other health effects (Table 1). The causes of such increases, however, differed with season.

During Feb-Apr, infrared absorption by emCO₂ warmed air temperatures (Figure 4c) up to ~3 km altitude, increasing

the land-ocean temperature gradient by about 0.2 K over 50 km, increasing surface sea-breeze wind speeds by ~0.06 m/s, and increasing water vapor transport to and soil–water evaporation in Los Angeles (Figure 4d). Higher temperatures and water vapor slightly increased ozone and PM_{2.5} for the reasons given in ref 13. The high wind speeds also increased resuspension of road and soil dust and moved PM more to the eastern basin.

During summer, Los Angeles boundary layer heights, temperature inversions, land-sea temperature gradients, sea breeze wind speeds, water evaporation rates, column water vapor, and stratus cloud formation are greater than in summer. Since boundary-layer heights were higher during the Aug-Oct simulations, CO₂ mixed faster up to higher altitudes during summer. Initially, the higher CO₂ warmed the air up to 4 km above topography, but the higher

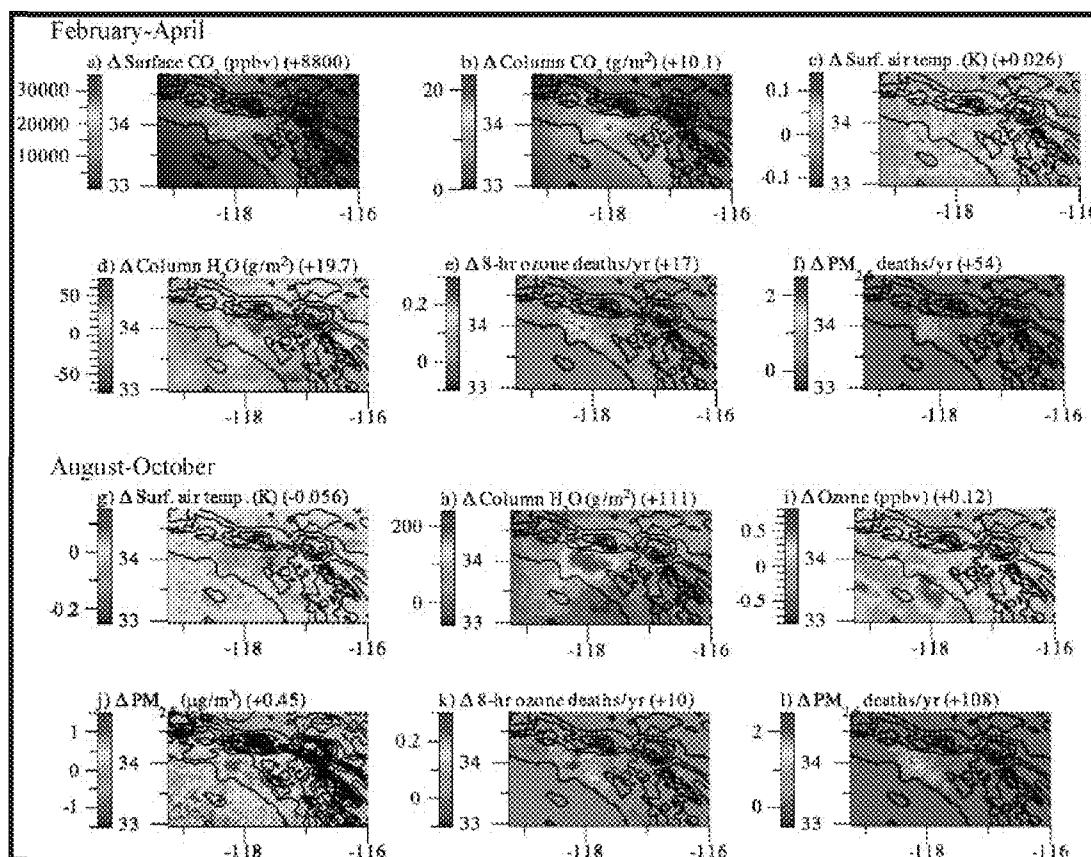


FIGURE 4. Same as Figure 2 but for the Los Angeles domain and for Feb-Apr and Aug-Oct.

temperatures from 1.5–4 km decreased the upper-level sea-breeze return flow (figures not shown) decreased pressure aloft, reducing the flow of moisture from land to ocean aloft (increasing it from ocean to land), increasing cloud optical depth over land by up to 0.4–0.6 optical depth units, decreasing summer surface solar radiation by at most 3–4 W/m² locally, decreasing local ground temperatures by up to 0.2 K (Figure 4g) while retaining the warmer air aloft. The excess water vapor aloft over land mixed to the surface (Figure 4h), increasing ozone (which increases chemically with water vapor at high ozone) and the relative humidity, which increased aerosol particle swelling, increasing gas growth onto aerosols, and reducing particle evaporation. In summary, emCO₂ increased ozone and PM_{2.5} and their corresponding health effects in both seasons, increasing air pollution mortality in California and Los Angeles by about 50–100 per year (Figure 4e,f,i,j, Table 1). The spatial positive correlations between increases in near-surface CO₂ and near-surface O₃ and PM_{2.5} were both visually apparent (Figure 4) and strongly statistically significant (e.g., Aug-Oct, $r = 0.14$, $p < 0.0001$ for ΔCO_2 vs ΔO_3 ; $r = 0.24$, $p < 0.0001$ for ΔCO_2 vs $\Delta\text{PM}_{2.5}$).

For the U.S. as a whole, the correlations between increases in CO₂ and increases in O₃ and PM_{2.5} premature mortality were also both visually apparent (Figure 5) and statistically significant ($r = 0.31$, $p < 0.0001$ for ΔCO_2 vs ΔO_3 mortality; $r = 0.32$, $p < 0.0001$ for ΔCO_2 vs $\Delta\text{PM}_{2.5}$ mortality). The Jun-Aug correlation between ΔCO_2 and $\Delta\text{PM}_{2.5}$ concentration ($r = 0.1$, $p < 0.0001$) was weaker than that between ΔCO_2 and $\Delta\text{PM}_{2.5}$ mortality, since local CO₂ fed back to meteorology, which fed back to PM_{2.5} outside of cities as well as in cities, but few people were exposed to such changes in PM_{2.5} outside of cities. Nevertheless, both correlations were strongly statistically significant.

The annual premature mortality rates due to emCO₂ in the U.S. were ~770 (300–1000), with ~20% due to ozone. This rate represented an enhancement of ~0.4% of the baseline mortality rate due to air pollution. With a U.S. anthropogenic emission rate of 5.76 GT-CO₂/yr (Table S2), this corresponds to ~134 (52–174) additional premature mortalities/GT-CO₂/yr over the U.S. Modeled mortality rates in Los Angeles for the Los Angeles domain were higher than those for Los Angeles in the California or U.S. domains due to the higher resolution of the Los Angeles domain; thus, mortality estimates for California and the U.S. may be low.

Implications

Worldwide, emissions of NO_x, HCs, CO, and PM are regulated. The few CO₂ regulations proposed to date have been justified based on its large-scale feedback to temperatures, sea levels, water supply, and global air pollution. No proposed CO₂ regulation is based on the potential impact of locally emitted CO₂ on local pollution as such effects have been assumed not to exist (21). Here, it was found that local CO₂ emissions can increase local ozone and particulate matter due to feedbacks to temperatures, atmospheric stability, water vapor, humidity, winds, and precipitation. Although modeled pollution changes and their health impacts are uncertain, results here suggests that reducing local CO₂ may reduce 300–1000 premature air pollution mortalities/yr in the U.S. and 50–100/yr in California, even if CO₂ in adjacent regions is not controlled. Thus, CO₂ emission controls may be justified on the same grounds that NO_x, HC, CO, and PM emission regulations are justified. Results further imply that the assumption behind the “cap and trade” policy, namely that CO₂ emitted in one location has the same impact as CO₂ emitted in another, is incorrect, as CO₂ emissions in populated cities have larger health impacts than CO₂ emissions in unpopulated

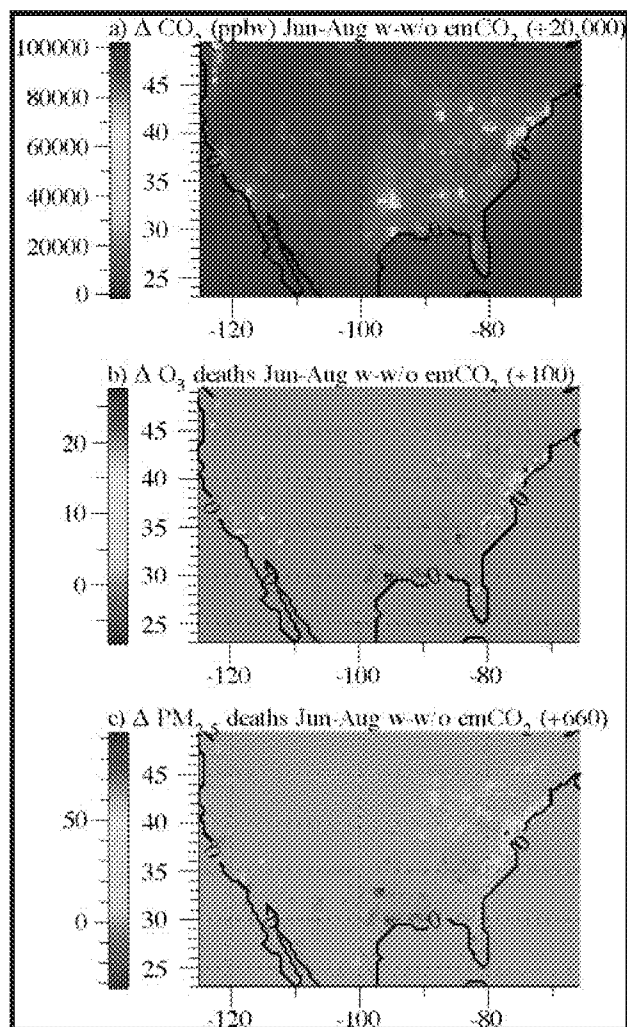


FIGURE 5. Same as Figure 2 but for the U.S. domain and for Jun-Aug. Numbers in parentheses Jun-Aug averaged changes (for CO₂) or total changes (for mortalities) over the domain.

areas. As such, CO₂ cap and trade, if done, should consider the location of emissions to avoid additional health damage.

Acknowledgments

Support came from the U.S. Environmental Protection Agency grant RD-83337101-O, NASA grant NX07AN25G, and the NASA High-End Computing Program.

Supporting Information Available

Model and emissions used for this study (Section 1), feedbacks in the model (Section 2), and a description of simulations (Section 3). This material is available free of charge via the Internet at <http://pubs.acs.org>.

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ES903018M

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Wednesday, August 13, 2025 10:12 AM
To: N H Lewis
Cc: Judith Curry; John Christy; Roy Spencer; Steven Koonin; nhlewis@btinternet.com
Subject: Re: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

Thanks Nic. Congrats on the ACP paper. We'll update the citation in the revision.
Cheers,
Ross

On Wed, Aug 13, 2025 at 4:20 AM N H Lewis <nhlewis@btinternet.com> wrote:

Dear All

You cited in chapter 4 of your DoE report the preprint of my Comment on Sherwood & Forest's 2024 ACP piece on climate sensitivity. I am pleased to say that the final version of my Comment has today been published in ACP, [here](#). Thanks to a detailed public comment by Steven Sherwood on my manuscript (which was treated as obviating the need for a second anonymous peer review: see [here](#)), I was able to make my comment considerably more extensive. Steven's understanding both of Lewis (2022) and of statistical aspects of Sherwood et al (2020) appears limited.

FYI, I submitted very favourable comments to The Associated Press on your DoE report. I have not responded to the Carbon Brief email. As you may be aware, although it is called a 'Fact check', the only ratings allowed for points being checked are False or Misleading – hardly unbiased!

All the best,

Nic

From: N H Lewis [mailto:nhlewis@btinternet.com]
Sent: 06 August 2025 15:43
To: 'Judith Curry'; 'Ross McKittrick'; 'John Christy'; 'Roy Spencer'; 'Steven Koonin'
Cc: 'nhlewis@btinternet.com'
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Many thanks in advance.

Best wishes, Leo

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CC: nhlewis@btinternet.com
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Attachments: Guidelines for contributors to Carbon Brief's DOE report factcheck.pdf; AP Inquiry - Your Input on GHG Endangerment Rescission Science

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Guidelines for contributors to Carbon Brief's DOE 'climate working group' report factcheck

Key documents

- [The report](#) – please use this version for all referencing. Lines are numbered down the left-hand margin. Please use the page number of this PDF version of the document.
- [Spreadsheet](#) for contributors (3 max per section) to register their interest in factchecking sections
- [Contributor spreadsheet](#). This is a template; each contributor should create their own copy, complete it and return it to Carbon Brief.

Step one

Register your interest in the factcheck.

Please use our [shared spreadsheet](#) to identify which section/s of the report you would like to comment on. Add your name to the column of the relevant tab.

(We do not need comments on the introduction from Chris Wright.)

If you would prefer to communicate this to us via Signal rather than a shared Google Sheet, please message CB editor Leo Hickman via +447731403979.

If you would prefer to remain anonymous, please let us know and we can mark your sections in the spreadsheet on your behalf, using a pseudonym.

Step two

Email science@carbonbrief.org confirming you have filled out the "identify which section/s you wish to comment on" spreadsheet.

Or, as mentioned above, send a Signal to Leo Hickman.

Step three

Download the [contributor spreadsheet](#).

Please *save a copy* with your full name in the file name, or your pseudonym if remaining anonymous.

Step four

Fill the contributor's spreadsheet. Contributors should:

- Identify the statements/statistics or figures being factchecked. Copy the relevant text from the report into the spreadsheet. Identify its page and line numbers, as found in [this document](#), or the Figure number as appropriate.
- Enter up to 150 words of comment/rebuttal in the "factcheck" column. Please keep this as clear, concise and objective as possible – and link to sources (see bullet below). Please avoid personalised remarks about authors, etc.
- Select a rating in the drop-down menu. The options are:
 - **FALSE** – for statements/statistics that are factually incorrect or untrue.
 - **MISLEADING** – for statements/statistics that are presented in a way that distort the meaning, create a false impression or omit/cherry-pick crucial details.

The rating of statements/statistics as "misleading" or "false" will allow Carbon Brief to create a visual overview of the DOE report with false/misleading colour scoring – creating an effect similar to this [New York Times](#) piece.

- Add the links to sources that back up your rebuttal in the final columns of the spreadsheet. If you need to add more than three, please create new columns to the right. Wherever possible, please cite peer-reviewed sources.
- If references cited in the DOE report are incorrect, or misleadingly used, please flag this in the spreadsheet – ideally, against the line where they are cited in the report's main text.

Step five

Send your spreadsheet back to Carbon Brief via email or Signal.

Deadline: Monday 11 August 2025 - 0900 GMT

From: John Christy <climateman60@gmail.com>
Sent: Thursday, July 31, 2025 1:05 PM
To: Ross McKitrick
Cc: Steven Koonin; Roy W. Spencer; Judith Curry; Josh Loucks; Seth Cohen; Travis Fisher
Subject: Re: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

Cliff Mass just received the Carbon Brief questionnaire, but I haven't even though my papers are cited.

On Thu, Jul 31, 2025 at 11:44 AM Ross McKitrick <ross.mckitrick@gmail.com> wrote:

I knew Zeke would object to that. They buried the key figure in the online appendix. We can cite the main part of their discussion (one of the DoE reviewers brought this up too) but it doesn't change the findings in question.

On Thu, Jul 31, 2025 at 12:38 PM Steven Koonin <steven.koonin@gmail.com> wrote:

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From: Vogelsang, Timothy <tjv@msu.edu>
Sent: Thursday, July 31, 2025 12:19 PM
To: Ross McKitrick <rmckitri@uoguelph.ca>; John Christy <climateman60@gmail.com>
Subject: RE: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

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Tim

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Ross

Dr. Ross McKittrick

Professor of Economics

Department of Economics and Finance

rossmckitrick.com

<image001.png>

University of Guelph | Guelph ON Canada N1G 3P9

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It's interesting to watch the machine swing into gear. There is a public comment docket opening up and I expect there will be quite the avalanche of material submitted, which we will need to prepare responses to, all of which will form part of the public record. If the comments are substantive we'll readily make revisions. We responded to a lot of comments from the internal DoE staff during the pre-publication review stage. But some of the most hostile comments didn't provide any data or citations in support so we couldn't do anything with them.

Ross

Dr. Ross McKittrick

Professor of Economics

Department of Economics and Finance

rossmckitrick.com

<image001.png>

University of Guelph | Guelph ON Canada N1G 3P9

From: Vogelsang, Timothy <tjv@msu.edu>

Sent: Thursday, July 31, 2025 12:02 PM

To: Ross McKittrick <rmckitri@uoguelph.ca>; John Christy <climateman60@gmail.com>

Subject: FW: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

CAUTION: This email originated from outside of the University of Guelph. Do not click links or open attachments unless you recognize the sender and know the content is safe. If in doubt, forward suspicious emails to IThelp@uoguelph.ca.

Ross and John,

I just got this email. Maybe you know about this group. I'm sure this is just the tip of the iceberg of pushback coming.

Tim

From: Leo Hickman <leo.hickman@carbonbrief.org>
Sent: Thursday, July 31, 2025 11:49 AM
To: Leo Hickman <leo.hickman@carbonbrief.org>
Subject: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

Hello,

I'm contacting you because we have noticed that at least one of your studies has been cited in a new report published this week by the US Dept of Energy titled, "A Critical Review of Impacts of Greenhouse Gas Emissions on the U.S. Climate."

A number of scientists cited in the report have already publicly highlighted that their findings have been falsely or misleadingly characterised. It seems that the report is intended to be used as scientific justification by the Trump administration in its efforts to revoke the US Environmental Protection Agency's "endangerment finding" on greenhouse gases.

Carbon Brief is now seeking your help to assess whether your own study, or indeed your area(s) of expertise more widely, have been mischaracterised in the report. This is part of a wider 'crowdsourced' fact-checking effort we are now convening to draw on inputs from experts in their respective fields.

I have attached a PDF with some instructions on how you can participate with your own insights and reflections, should you wish. (The instructions include ways to do this anonymously and securely, if that is your preference.)

Additionally, if you know of a colleague or co-author who might wish to participate, please feel free to forward this email to them.

Our deadline for submissions is Monday 11 August 2025 - 0900 GMT.

Many thanks in advance.

Best wishes, Leo

--

Leo Hickman

Editor, Carbon Brief

Phone: + 44 (0) 7731 403979

Social: Twitter; BlueSky; LinkedIn

Web: www.carbonbrief.org

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From: Ross McKitrick <ross.mckitrick@gmail.com>
Sent: Thursday, July 31, 2025 12:27 PM
To: Roy W. Spencer; Judith Curry; John Christy; Steven Koonin; Josh Loucks; Cohen, Seth; Fisher, Travis
Subject: Fwd: Fw: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'
Attachments: image001.png

John and I got this from Tim Vogelsang at MSU. Carbon Brief is contacting everyone whose work was cited trying to gather up claims of misrepresentation. As Tim notes, there is no option on the form for saying your work was correctly characterized.

From: Vogelsang, Timothy <tjv@msu.edu>
Sent: Thursday, July 31, 2025 12:19 PM
To: Ross McKitrick <rmckitri@uoguelph.ca>; John Christy <climateman60@gmail.com>
Subject: RE: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

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If you look at the pdf I was sent with the instructions, there is no option to report that someone's research has been correctly characterized. That's not a very scientific factchecking exercise, is it!

Tim

From: Ross McKitrick <rmckitri@uoguelph.ca>
Sent: Thursday, July 31, 2025 12:15 PM
To: Vogelsang, Timothy <tjv@msu.edu>; John Christy <climateman60@gmail.com>
Subject: Re: Carbon Brief factcheck - your study has been cited in new US DoE 'critical review'

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Sent: Thursday, July 31, 2025 12:02 PM

To: Ross McKittrick <rmckitri@uoguelph.ca>; John Christy <climateman60@gmail.com>

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Tim

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Many thanks in advance.

Best wishes, Leo

--

Leo Hickman

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Web: www.carbonbrief.org

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From: Judith Curry <curry.judith@gmail.com>
Sent: Wednesday, August 27, 2025 9:31 AM
To: Ross McKittrick; Steve Koonin; John Christy; Roy Spencer
Subject: Comments from Scafetta

All good suggestions

----- Forwarded Message -----

From: "nicola.scafetta@unina.it" <nicola.scafetta@unina.it>
To: 'Curry Judith' <curry.judith@yahoo.com>
Sent: Tuesday, August 26, 2025 at 02:57:13 PM PDT
Subject: RE: Seeking your input on the DOE climate assessment report

Dear Judith,

See below my suggestions.

If I find something else, I will let you know.

The DOE document also needs some extended editing and several references need to be fixed or updated.

Best Regards

Nicola

Page 8:

Update the Coral cover data using the latest report:

Australian Institute of Marine Science. (2025). Annual Summary Report of Coral Reef Condition 2024/25. AIMS.
<https://www.aims.gov.au/monitoring-great-barrier-reef/gbr-condition-summary-2024-25>

Page 12-13: regarding Connolly et al. (2021) which I coauthor.

You write:

The IPCC assesses the change in the radiative forcing by the sun to be negligible, based on their preference for data reconstructions that imply minimal solar change since preindustrial times. But Connolly et al. (2021) reviewed sixteen different Total Solar Irradiance (TSI) reconstructions in the literature covering the years 1600-2000; the reconstructions vary from almost no change in TSI to a relatively large upward trend. Those authors note that the variation in TSI reconstructions combined with variations in surface temperature reconstructions allows for inferences consistent with either no or most 20th century warming being attributable to the sun.

Your paragraph might be corrected as:

The IPCC considers changes in solar radiative forcing to be negligible, primarily due to its reliance on data reconstructions that suggest minimal long-term variation in solar output since preindustrial times. However, Connolly et al. (2021, 2023) and Scafetta (2023) conducted a comprehensive review of up to 27 different Total Solar Irradiance (TSI) reconstructions spanning several centuries up to around 2020. These reconstructions show considerable divergence — ranging from virtually no secular change in TSI to a significant upward trend. The authors argue that this variability, when combined with differences in surface temperature reconstructions, opens the door to a wide range of interpretations. Depending on which TSI dataset and climate record are used — and whether climate sensitivity is assumed to respond solely to TSI or also to other solar-related mechanisms (such as changes in cosmic ray flux) — one could infer that either almost none or nearly 50% or more of the 20th-century warming might be attributable to solar influences.

references:

Connolly, R., Soon, W., Connolly, M., Baliunas, S., Berglund, J., Butler, C. J., Cionco, R. G., Elias, A. G., Fedorov, V. M., Harde, H., Henry, G. W., Hoyt, D. V., Humlum, O., Legates, D. R., Lüning, S., Scafetta, N., Solheim, J.-E., Szarka, L., van Loon, H., Velasco Herrera, V. M., Willson, R. C., Yan, H., & Zhang, W. (2021). How much has the Sun influenced Northern Hemisphere temperature trends? An ongoing debate. *Research in Astronomy and Astrophysics*, 21(6), 131.

Connolly, R., Soon, W., Connolly, M., Baliunas, S., Berglund, J., Butler, C. J., Cionco, R. G., Elias, A. G., Fedorov, V. M., Harde, H., Henry, G. W., Hoyt, D. V., Humlum, O., Legates, D. R., Scafetta, N., Solheim, J.-E., Szarka, L., Velasco Herrera, V. M., Yan, H., Zhang, W., 2023. Challenges in the Detection and Attribution of Northern Hemisphere Surface Temperature Trends Since 1850. *Research in Astronomy and Astrophysics*, 23(10), 105015.

Scafetta, N., 2023. Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records. *Geoscience Frontiers*, 14(6), 101650.

Page 13:

you write:

A particularly thorny issue is the gap in TSI data between 1989 and 1991 due to a delay in the launch of a monitor following the Space Shuttle Challenger disaster on January 28 1986. This delay prevented a replacement satellite from being launched in time to overlap with, and its readings to be intercalibrated with, the prior system (Zacharias 2014, Scafetta et al. 2019). This is called the ACRIM (Active Cavity Radiometer Irradiance Monitor) gap problem. The question of whether there is an upward trend in TSI over 1978 to 2018 hangs on how the ACRIM data gap is filled. Connolly et al. (2021) found that the IPCC's consensus statements on solar forcing were formulated prematurely through the suppression of dissenting scientific opinions.

Your paragraph might be corrected as:

One of the most contentious issues in the reconstruction of Total Solar Irradiance (TSI) is the data gap between the ACRIM1 and ACRIM2 high-precision satellite measurements from 1989 to 1991. This discontinuity arose due to the delay in launching the ACRIM2 instrument, following the Space Shuttle Challenger disaster on January 28, 1986, which postponed the deployment of its replacement satellite. As a result, there was no high-precision data to temporally overlap

ACRIM1 and ACRIM2, preventing direct intercalibration of their measurements (Zacharias, 2014; Scafetta et al., 2019). This issue is commonly referred to as the ACRIM gap. The presence and treatment of this gap critically influence whether TSI reconstructions show a significant upward trend from 1978 to 2018 as claimed by the ACRIM science group (Scafetta & Willson, 2014; Scafetta et al., 2019) or remain relatively flat as claimed by the PMOD group (Fröhlich, 2012). The way this gap is bridged—whether using proxy data, alternative satellite records, or model-based adjustments—can lead to substantially different conclusions about the role of solar variability in recent climate change. Connolly et al. (2021, 2024) and Scafetta (2023) argue that the IPCC’s consensus on solar forcing may have been prematurely established, in part due to the exclusion of alternative interpretations and dissenting scientific views regarding the ACRIM gap and its implications for long-term solar trends.

references:

Connolly, R., Soon, W., Connolly, M., Baliunas, S., Berglund, J., Butler, C. J., Cionco, R. G., Elias, A. G., Fedorov, V. M., Harde, H., Henry, G. W., Hoyt, D. V., Humlum, O., Legates, D. R., Lüning, S., Scafetta, N., Solheim, J.-E., Szarka, L., van Loon, H., Velasco Herrera, V. M., Willson, R. C., Yan, H., & Zhang, W. (2021). How much has the Sun influenced Northern Hemisphere temperature trends? An ongoing debate. *Research in Astronomy and Astrophysics*, 21(6), 131.

Connolly, R., Soon, W., Connolly, M., Cionco, R.G., Elias, A. G., Henry, G. W., Scafetta, N., Velasco Herrera, V.M., 2024. Multiple new or updated satellite total solar irradiance (TSI) composites (1978–2023). *The Astrophysical Journal*, 975(1), 102.

Fröhlich, C., 2012. Total solar irradiance observations. *Surveys in Geophysics*, 33(3–4), 453–473.

Scafetta, N., Willson, R.C., 2014. ACRIM total solar irradiance satellite composite validation versus TSI proxy models. *Astrophysics and Space Science*, 350, 421–442.

Scafetta, N., Willson, R.C., Lee, J.N., Wu, D.L., 2019. Modeling quiet solar luminosity variability from TSI satellite measurements and proxy models during 1980–2018. *Remote Sensing*, 11(21), 2569.

Scafetta, N., 2023. Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records. *Geoscience Frontiers*, 14(6), 101650.

Page 21, you write:

... Further they provided no caution about using the land record for climate measurement despite conceding the evidence for UHI contamination. Recently Soon et al. (2023) estimated an urbanization bias in the Northern Hemisphere land record over 1850-2018 sufficient to increase the trend in the blended record from 0.55°C to 0.89°C per century.

Some studies providing evidence against UHI contamination compared warming rates between rural and urban locations (Jones et al. 1990, Peterson et al. 1999, Wickham et al. 2013). It is not known whether such methods would be capable of detecting UHI bias even when present. The influence of UHI warming is logarithmic in population, in other words it is strongest at low population density then levels off as local urbanization expands (Oke 1973, Spencer et al. 2025). Hence failure to find a difference in warming rates between urban and rural stations does not prove the absence of UHI contamination. McKittrick (2013) provided an empirical demonstration in which the rural/urban trends were not significantly different in a data set shown on other grounds to be contaminated with UHI bias.

Your paragraph might be corrected as:

...Further, no caution was provided regarding the use of land-based temperature records for climate assessment, despite an explicit acknowledgment of evidence for urban heat island (UHI) contamination.

Several studies that argue against significant UHI influence have compared warming rates between nominally rural and urban stations (Jones et al., 1990; Peterson et al., 1999; Wickham et al., 2013). However, it remains uncertain whether such comparative methods are sensitive enough to detect UHI bias when it is present. The effect of UHI warming is known to follow a logarithmic relationship with population density — meaning it is most pronounced at low population levels and tends to plateau as urbanization intensifies (Oke, 1973; Spencer et al., 2025). Consequently, the absence of a

detectable difference in warming rates between urban and rural stations does not constitute definitive evidence against UHI contamination. McKittrick (2013) demonstrated this empirically by showing that rural and urban trends were statistically indistinguishable in a dataset that was independently shown to be affected by UHI bias.

In a broader analysis, Scafetta (2021, 2025) identified non-climatic warming biases in land surface temperature records by examining the disproportionate increase in nighttime minimum temperatures (Tmin) relative to daytime maximums (Tmax), and by comparing sea and land surface data with lower troposphere temperature trends and GCM simulations. He concluded that up to 40% of the reported land surface warming could be attributed to such non-climatic influences. Similarly, Soon et al. (2023) compared Northern Hemisphere land temperature records with verified rural station data and estimated an urbanization bias over the period 1850–2018 sufficient to inflate the warming trend from 0.55°C to 0.89°C per century in blended datasets.

References:

Scafetta, N., 2021. Detection of non-climatic biases in land surface temperature records by comparing climatic data and their model simulations. *Climate Dynamics*, 56(9–10), 2959–2982.

Scafetta, N., 2025. Detection, attribution, and modeling of climate change: Key open issues. *Gondwana Research*, <https://doi.org/10.1016/j.gr.2025.05.001>.

Soon, W., Connolly, R., Connolly, M., Akasofu, S.-I., Baliunas, S., Berglund, J., Bianchini, A., Briggs, W.M., Butler, C.J., Cionco, R.G., Crok, M., Elias, A. G., Fedorov, V.M., Gervais, F., Harde, H., Henry, G.W., Hoyt, D.V., Humlum, O., Legates, D.R., Lupo, A.R., Maruyama, S., Moore, P., Ogurtsov, M., ÓhAiseadha, C., Oliveira, M.J., Park, S.-S., Qiu, S., Quinn, G., Scafetta, N., Solheim, J.-E., Steele, J., Szarka, L., Tanaka, H.L., Taylor, M.K., Vahrenholt, F., Velasco Herrera, V.M., Zhang, W., 2023. The detection and attribution of Northern Hemisphere land surface warming (1850–2018) in terms of human and natural factors: Challenges of inadequate data. *Climate*, 11(9), 179.

plus your other references:

Page 23:

In the references, correct "Scaffeta, Nicola" with "Scafetta, Nicola"

Page 27: Correct "Scaffeta 2021" with "Scafetta, 2021".

Page 28: Correct "Lewis (2022)" in "Lewis (2023)"

Page 29: update the reference to "Lewis, N., 2025. Comment on "Opinion: Can uncertainty in climate sensitivity be narrowed further?" by Sherwood and Forest (2024). *Atmospheric Chemistry and Physics*, 25, 8821–8829."

Page 33: Correct "Scaffeta (2023)" with "Scafetta (2023)".

Page 36. you cite several times "Po-Chedley et al., 2021", but the work is missing in the bibliography. Is it this one?

Po-Chedley, S., Cameron-Smith, P. J., Santer, B. D., Painter, J. F., Fueglistaler, S., Fu, Q., & Zelinka, M. D. (2021). Natural variability contributes to model–satellite differences in tropical tropospheric warming. *Proceedings of the National Academy of Sciences*, 118(13), e2019985118.

Page 45: Correct "Scaffeta, N (2023)" with "Scafetta, N. (2023)".

Page 85:

you write:

"However, the recommended forcing dataset for the CMIP6 climate model simulations used in AR6 for attribution studies averages two data sets with low solar variability (Matthes, 2017)."

change in:

"However, the recommended forcing dataset for the CMIP6 climate model simulations used in AR6 for attribution studies averages two data sets (NRLTSI2 e SATIRE) with very low solar variability (Matthes, 2017)."

you write:

"While AR6 shows a substantially greater solar impact than does AR5, the overall impact of solar forcing on the climate was still assessed to be small compared to anthropogenic forcing. However, the impact of solar variations on the climate is uncertain and subject to substantial debate (Lockwood, 2012; Connolly et al., 2021) - something that is not evident in the IPCC assessment reports."

change in:

"While AR6 theoretically acknowledges a substantially greater solar impact than does AR5, the the adoption of the solar forcing by Matthes (2017) implies that the overall impact of solar forcing on the climate from 1850-1900 to 2011-2020 was assessed to be essentially "zero" (AR6, "Summary for Policymakers", Figure SPM.2) and, therefore, negligible compared to anthropogenic forcing. However, the impact of solar variations on the climate is still highly uncertain and subject to substantial debate (Lockwood, 2012; Connolly et al., 2021) - something that is not evident in the IPCC assessment reports."

you write:

"The variations of TSI over time remains a challenging problem. Since 1978, there have been direct measurements of TSI from satellites. However, the data exhibits non-negligible inconsistencies, and interpreting any multi-decadal trends in TSI requires comparisons of observations from overlapping satellites. There are several rival composite TSI datasets that disagree as to whether TSI increased or decreased during the period 1986–96 (the ACRIM gap; see Chapter 4). Further, the satellite record of TSI is used to calibrate proxy models that infer past solar variations from sunspots and cosmogenic isotope measurements (Velasco Herrera et al., 2015)."

change in:

"Understanding long-term variations in Total Solar Irradiance (TSI) remains a complex and unresolved challenge. Although direct satellite measurements have been available since 1978, the data contain notable inconsistencies, making it difficult to extract reliable multi-decadal trends without carefully comparing overlapping satellite records. Multiple competing composite datasets offer conflicting views on TSI's decadal modulation (Connolly et al., 2024). A key example is the uncertainty surrounding the period between the solar minima of 1986 and 1996, where it remains unclear whether TSI increased or slightly declined—largely due to the unresolved controversy over how to bridge the ACRIM-gap from 1989 to 1991 (see Chapter 4). This ambiguity also complicates the selection and calibration of proxy-based models that reconstruct historical solar variability using sunspot records and cosmogenic isotopes (Velasco Herrera et al., 2015; Scafetta et al., 2019)."

Additional Bibliography:

Connolly, R., Soon, W., Connolly, M., Cionco, R.G., Elias, A. G., Henry, G. W., Scafetta, N., Velasco Herrera, V.M., 2024. Multiple new or updated satellite total solar irradiance (TSI) composites (1978–2023). *The Astrophysical Journal*, 975(1), 102.

Scafetta, N., Willson, R.C., Lee, J.N., Wu, D.L., 2019. Modeling quiet solar luminosity variability from TSI satellite measurements and proxy models during 1980–2018. *Remote Sensing*, 11(21), 2569.

Scafetta, N., 2023. Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records. *Geoscience Frontiers*, 14(6), 101650.

You write:

"There is substantial evidence for high solar activity in the second half of the 20th century (starting in 1959) and extending into the 1990's, before a decline in the early 21st century; this period is often termed the "Modern Maximum."

(Chatzistergos et al., 2023; Solanki et al., 2004; Usoskin et al., 2007). However, some scientists have concluded that it is not possible to be confident of any multi-decadal trend in TSI (Schmutz, 2021)."

change in:

"There is considerable evidence that solar activity during the first half of the 20th century was lower than in the second half, extending into the 1990s before declining in the early 21st century - a period commonly referred to as the "Modern Maximum." However, while some researchers (e.g., Chatzistergos et al., 2023; Solanki et al., 2004; Usoskin et al., 2007) argue that Total Solar Irradiance (TSI) increased only slightly during this time, others (e.g., Schmutz, 2021; Scafetta, 2021, 2025) contend that such low-variability TSI models cannot adequately account for the magnitude of climate change observed from the Medieval Warm Period (MWP) to the Little Ice Age (LIA) and from the LIA to the present."

Additional Bibliography:

Scafetta, N., 2025. Detection, attribution, and modeling of climate change: Key open issues. *Gondwana Research*, [https://doi.org/10.1016/j.gr.2025.05.001].

You write:

"This uncertainty causes some reconstructions of TSI from 1750 to have low variability (implying a very low impact of solar variations on global mean surface temperature) whereas datasets with high TSI variability can explain more than 70 percent of the temperature variability since preindustrial times (Scafetta, 2013; Stefani, 2021). The choice of TSI satellite record used in an analysis can therefore substantially influence how much climate change is attributed to human versus natural forcings."

change in:

"This uncertainty leads some reconstructions of Total Solar Irradiance (TSI) since 1750 to have low secular variability, implying a minimal influence of solar changes on global mean surface temperature. In contrast, datasets with higher TSI secular variability may account for up to 50 percent or more of the temperature changes observed since preindustrial times (Connolly et al., 2023; Scafetta, 2023; Stefani, 2021). The choice of TSI satellite record used to select and calibrate the TSI proxy models plays a critical role in determining how much climate change is attributed to anthropogenic versus natural forcings."

Additional Bibliography:

Connolly, R., Soon, W., Connolly, M., Baliunas, S., Berglund, J., Butler, C. J., Cionco, R. G., Elias, A. G., Fedorov, V. M., Harde, H., Henry, G. W., Hoyt, D. V., Humlum, O., Legates, D. R., Scafetta, N., Solheim, J.-E., Szarka, L., Velasco Herrera, V. M., Yan, H., Zhang, W., 2023. Challenges in the Detection and Attribution of Northern Hemisphere Surface Temperature Trends Since 1850. *Research in Astronomy and Astrophysics*, 23(10), 105015.

Scafetta, N., 2023. Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records. *Geoscience Frontiers*, 14(6), 101650.

You wrote:

"There is growing evidence that other aspects of solar variability, which are referred to as solar indirect effects, either amplify TSI forcing or are independent of TSI forcing. Scafetta et al. (2023) suggests that ~80 percent of solar influence on climate might stem from non-TSI mechanisms. There are numerous candidate processes, including solar ultraviolet changes; energetic particle precipitation; atmospheric-electric-field effect on cloud cover; cloud changes produced by solar-modulated galactic cosmic rays; large relative changes in the magnetic field; and the strength of the solar wind. Such solar indirect effects are not included in climate models, although indirect methods of estimating their impacts suggest they are significant. However, claims of non-TSI mechanisms influencing climate are uncertain and debated."

change in:

"Emerging research increasingly points to the role of solar indirect effects—aspects of solar variability that either amplify Total Solar Irradiance (TSI) forcing or operate independently of it. According to Scafetta et al. (2023), as much as 80% of

the Sun's climatic influence may arise from mechanisms not directly linked to TSI direct forcing. Several candidate processes have been proposed, including variations in solar ultraviolet radiation, energetic particle precipitation, modulation of cloud cover via atmospheric electric fields, changes induced by galactic cosmic rays influenced by solar activity, fluctuations in the solar magnetic field, and the strength of the solar wind. These indirect solar effects are not currently represented in standard climate models, yet alternative methods for estimating their impact suggest they could be climatically significant. Nonetheless, the extent to which non-TSI mechanisms affect climate remains uncertain and subject to ongoing scientific debate."

Bibliography:

Scafetta, N., 2023. Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records. *Geoscience Frontiers*, 14(6), 101650.

Page 88

you write:

"The cooling period between 1945 and 1976 has been referred to as the "grand hiatus." Numerous causes have been hypothesized: natural internal variability from fluctuations associated with the Pacific Decadal Oscillation and Atlantic Multidecadal Oscillation; cooling from increased emissions of aerosols from industrial activities; increased heat uptake in the Atlantic, Southern and Equatorial Pacific Oceans. Thompson et al. (2010) find that the hemispheric differences in temperature trends in the middle of the twentieth century stem largely from a rapid drop in Northern Hemisphere sea surface temperatures of about 0.3 °C between about 1968 and 1972."

change in:

"The cooling period between 1945 and 1976 is often referred to as the "grand hiatus." Several potential causes have been proposed: reduced solar activity — particularly when certain TSI proxy models are considered (Connolly et al., 2023; Scafetta, 2023); internal climate variability linked to the Pacific Decadal Oscillation and Atlantic Multidecadal Oscillation; cooling effects from increased aerosol emissions due to industrial activity; and enhanced oceanic heat uptake in the Atlantic, Southern, and Equatorial Pacific Oceans. Thompson et al. (2010) found that hemispheric differences in mid-20th-century temperature trends were largely driven by a sharp decline in Northern Hemisphere sea surface temperatures of approximately 0.3 °C between 1968 and 1972. The quasi-60-year oscillatory pattern of the Atlantic Multidecadal Oscillation (AMO) and Pacific Decadal Oscillation (PDO) is also evident in the global sea level record, the North Atlantic Oscillation (NAO) index, and other climate records, with signals extending back several centuries (e.g. Scafetta, 2014)"

Additional Bibliography:

Scafetta, N., 2014. Multi-scale dynamical analysis (MSDA) of sea level records versus PDO, AMO, and NAO indexes. *Climate Dynamics*, 43(1–2), 175–192.

you write:

"The Great Pacific Climate Shift of 1976–1977 was a notable climatic event characterized by an abrupt change in the North Pacific Ocean's atmosphere-ocean system that interacted with global climate patterns. This shift is closely associated with the Pacific Decadal Oscillation (PDO) that oscillates between warm and cool phases over decades. The 1976 shift marked a transition from a predominantly negative (cool) PDO phase (1947–1976) to a positive (warm) phase (1977 through 2000), with significant implications for global and regional climate patterns, including the frequencies of El Niño and La Niña events. The Great Pacific Climate Shift coincided with the beginning of a period of accelerated global warming. When the Great Pacific Climate Shift is accounted for in climate attribution analyses since 1950, 40 percent or more of the warming in the second half of the 20th century is attributed to natural internal variability (McLean et al., 2009; Tung and Zhou, 2013; Chylek et al., 2016; Scafetta, 2021)."

change in:

The Great Pacific Climate Shift of 1976–1977 was a significant climatic event marked by an abrupt reorganization of the atmosphere–ocean system in the North Pacific, with far-reaching interactions across global climate patterns. This shift is closely linked to the Pacific Decadal Oscillation (PDO), which alternates between warm and cool phases over multi-

decadal timescales. The 1976 transition signaled a shift from a predominantly negative (cool) PDO phase (1947–1976) to a positive (warm) phase (1977–2000), influencing regional and global climate dynamics, including the frequency and intensity of El Niño and La Niña events. Notably, the Great Pacific Climate Shift coincided with the onset of a period of accelerated global warming. When this shift is incorporated into climate attribution analyses post-1950, studies suggest that 40 percent or more of the warming observed in the latter half of the 20th century may be attributed to natural variability — whether internal or solar-astronomically induced (McLean et al., 2009; Tung & Zhou, 2013; Chylek et al., 2016; Scafetta, 2013, 2021).

To help protect your privacy, Microsoft Office prevented automatic download of the picture from the Internet.

From: Steven Koonin [steven.koonin@gmail.com]
Sent: 8/18/2025 12:45:58 PM
To: 'Judith Curry' [curry.judith@gmail.com]
CC: 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'John Christy' [climatemanager60@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]
Subject: FW: upper end of sealevel
Attachments: Earth's Future - 2024 - Grandey - Fusion of Probabilistic Projections of Sea-Level Rise.pdf; Horton et al_2020_Expert survey_NPG Climate and Atmospheric Science.pdf

Some input from my friend Ben Horton on sea level projections.

SEK

From: %Benjamin P. Horton <BPHorton@ntu.edu.sg>
Sent: Monday, August 18, 2025 1:12 AM
To: Steven Koonin <koonin@stanford.edu>
Subject: upper end of sealevel

Hey Steve

I don't know whether in your DOE report you used Grandey et al. 2024 paper in your analysis

Here we give the probability of sea-level being greater than 1m. We estimate there is only a 16% at high emissions (SSP5 8.5). See Figure 5, section 3.2

The scientific community would find that surprisingly low. Indeed, you can contrast that with the expert elicitation of 500 sea level scientists I did where 45% of the community thought sea level would be greater than 1m by 2100

I hope you are doing well

Ben

Earth's Future

RESEARCH ARTICLE

10.1029/2024EF005295

Special Collection:

Regional Sea Level Change and
Society

Key Points:

- We fuse the complementary strengths of alternative projections of sea-level rise
- The fusion is a single probabilistic projection that quantifies a best estimate of scientific uncertainty
- The fusion provides a meaningful *very likely* range and an associated high-end projection

Supporting Information:

Supporting Information may be found in the online version of this article.

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Citation:

Grandey, B. S., Dauwels, J., Koh, Z. Y., Horton, B. P., & Chew, L. Y. (2024). Fusion of probabilistic projections of sea-level rise. *Earth's Future*, 12, e2024EF005295. <https://doi.org/10.1029/2024EF005295>

Received 4 SEP 2024

Accepted 15 NOV 2024

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S. Grandey

Fusion of Probabilistic Projections of Sea-Level Rise

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Abstract A probabilistic projection of sea-level rise uses a probability distribution to represent scientific uncertainty. However, alternative probabilistic projections of sea-level rise differ markedly, revealing ambiguity, which poses a challenge to scientific assessment and decision-making. To address the challenge of ambiguity, we propose a new approach to quantify a best estimate of the scientific uncertainty associated with sea-level rise. Our proposed fusion combines the complementary strengths of the ice sheet models and expert elicitations that were used in the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC). Under a low-emissions scenario, the fusion's *very likely* range (5th–95th percentiles) of global mean sea-level rise is 0.3–1.0 m by 2100. Under a high-emissions scenario, the *very likely* range is 0.5–1.9 m. The 95th percentile projection of 1.9 m can inform a high-end storyline, supporting decision-making for activities with low uncertainty tolerance. By quantifying a best estimate of scientific uncertainty, the fusion caters to diverse users.

Plain Language Summary A probabilistic projection of sea-level rise uses a probability distribution to represent uncertainty. Using differing methods, scientists have constructed several alternative probabilistic projections of sea-level rise. By considering their complementary strengths, we propose to combine the alternative projections into a single fusion. The fusion quantifies our best estimate of the uncertainty associated with future sea-level rise. Under a low-emissions scenario, the fusion's *very likely* range of global mean sea-level rise is 0.3–1.0 m by 2100. Under a high-emissions scenario, the *very likely* range is 0.5–1.9 m. The fusion is easy to interpret and caters to diverse users.

1. Introduction

Probabilistic projections of sea-level rise support climate risk assessment and adaptation planning (Hermans et al., 2023; Rasmussen et al., 2020; Rodziejewicz et al., 2022). Each probabilistic projection uses a probability distribution to represent uncertainty (Kopp, Garner, et al., 2023). However, probabilistic projections are undermined by ambiguity (Text S1 in Supporting Information S1; Ellsberg, 1961; Kopp, Oppenheimer, et al., 2023). Much of this ambiguity is due to ice sheet processes (Bamber et al., 2022; Fox-Kemper et al., 2021). Ice sheet models may skillfully represent many important processes, enabling model ensembles to explore the uncertainty associated with these processes (Goelzer et al., 2020; Payne et al., 2021). However, models may fail to represent other important processes (Aschwanden et al., 2021). To complement the models, experts can consider the potential impact of these poorly-understood processes (Bamber et al., 2022). To project sea-level rise, scientists have developed alternative model-based and expert-based methods (Horton et al., 2018). Differing methods drive differences between alternative probabilistic projections (Kopp, Garner, et al., 2023). We refer to this ambiguity as “method ambiguity”.

Method ambiguity poses a challenge to scientific assessment (Kopp, Oppenheimer, et al., 2023). For example, the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) distinguishes between *medium confidence* and *low confidence* projections (Fox-Kemper et al., 2021). Using the *medium confidence* projections, the AR6 authors derive a *likely* range (17th–83rd percentiles). However, considering the substantial method ambiguity, they note they are unable to derive a *very likely* range (5th–95th percentiles; Fox-Kemper et al., 2021, p. 1298). This poses a challenge to decision-making: the absence of a *very likely* range and the associated 95th percentile high-end projection undermines planning of activities with low uncertainty tolerance.

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Writing – review & editing: Benjamin S. Grandey, Justin Dauwels, Zhi Yang Koh, Benjamin P. Horton, Lock Yue Chew

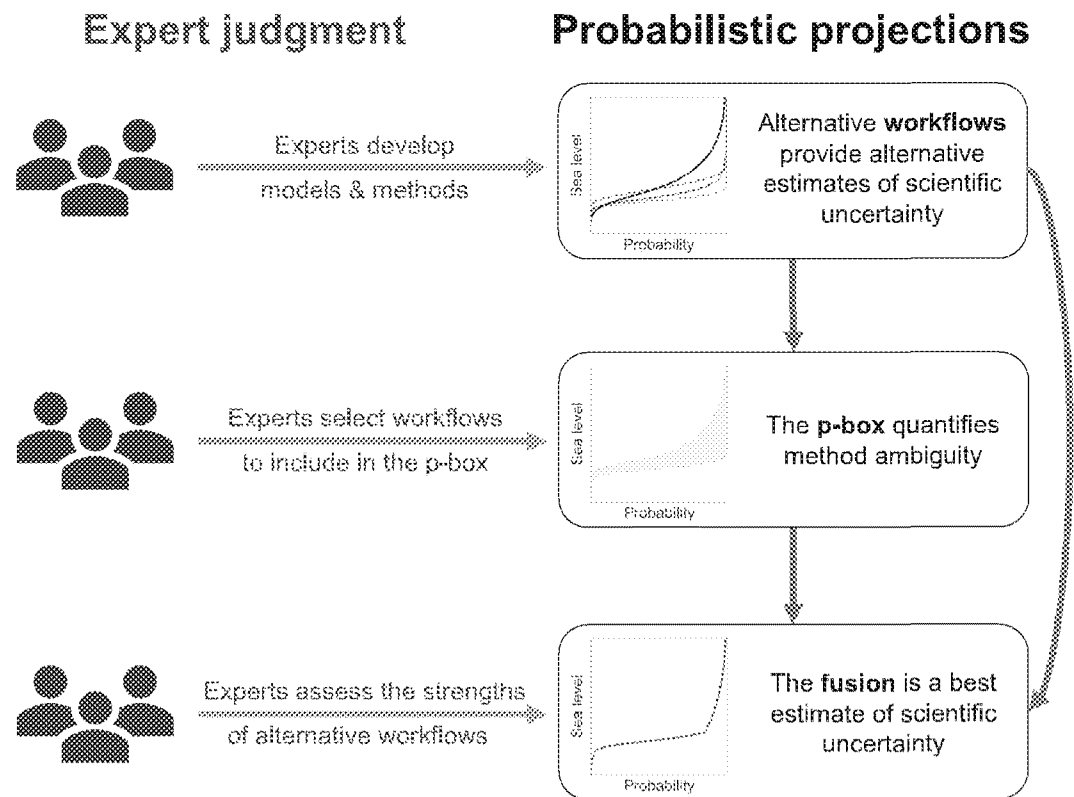


Figure 1. Expert judgment is integral throughout the process of projecting sea-level rise. Arrows indicate the flow of information from expert judgment (green arrows) and from probabilistic projections (blue arrows).

To address the challenge of method ambiguity, we propose a new approach to obtain a best estimate of the scientific uncertainty. We apply an additional layer of expert judgment to combine the complementary strengths of alternative probabilistic projections (Figure 1). We assume that the *medium confidence* projections reliably sample the most-likely central possibilities but underestimate the full range of the uncertainty distribution. We also assume that the *low confidence* projections offer valuable information about less-likely possibilities in the tails of the uncertainty distribution. Our proposed fusion is an informed best estimate of the scientific uncertainty, conditioned on our assumptions and a specific emissions scenario. We apply our fusion approach under both a low-emissions and a high-emissions scenario. Using the fusion, we can derive a *very likely* range and a 95th percentile projection, supporting decision-making.

2. Methods

2.1. IPCC AR6 Projection Workflows

We use data from the IPCC AR6 sea-level projections (Fox-Kemper et al., 2021; G. G. Garner et al., 2021; Kopp, Garner, et al., 2023). The global mean sea level (GMSL) projections are relative to the 1995–2014 baseline period (Kopp, Garner, et al., 2023). We present GMSL projections under the low-emissions SSP1-2.6 and high-emissions SSP5-8.5 scenarios (O'Neill et al., 2016).

The ice sheet and glacier components differ across the alternative IPCC AR6 projections. These alternative projections are referred to as “workflows” (Kopp, Garner, et al., 2023). We use workflows 1e, 2e, 3e, and 4 (Kopp, Garner, et al., 2023). Workflow 1e uses Antarctic ice sheet, Greenland ice sheet, and glacier components from a statistical emulator (Edwards et al., 2021; Fox-Kemper et al., 2021) of the multi-model ensembles of the Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6; S. Nowicki et al., 2020; S. M. J. Nowicki et al., 2016) and the Glacier Model Intercomparison Project (GlacierMIP; Marzeion et al., 2020). Workflow 2e uses different Antarctic ice sheet components, also based on statistical emulation of a multi-model ensemble (Levermann et al., 2020). Workflow 3e uses different Antarctic ice sheet components, based on results from a

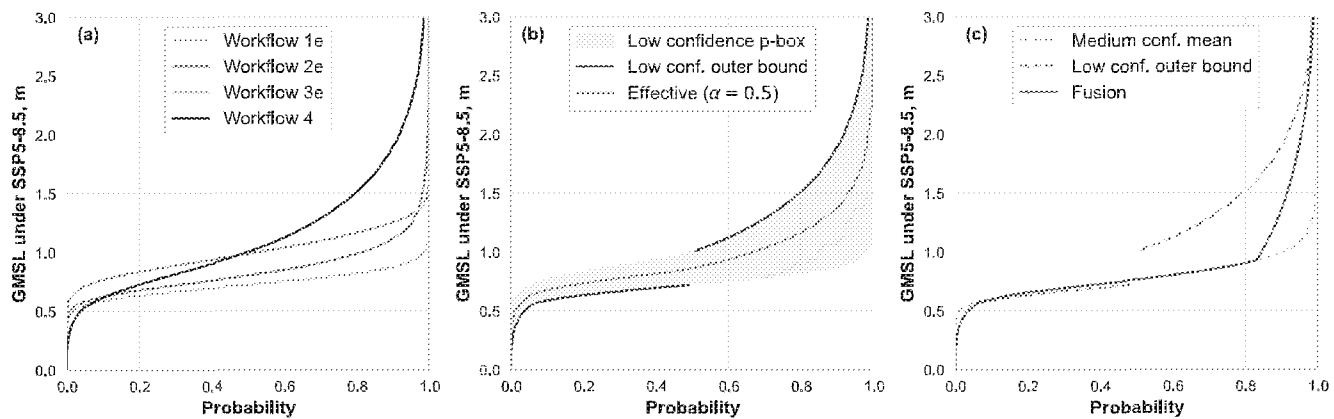


Figure 2. Quantile functions of GMSL in 2100 under SSP5-8.5. (a) The four alternative IPCC AR6 workflows. (b) The *low confidence* p-box (which spans the four workflows), the *low confidence* outer bound, and the ambiguity-neutral effective distribution (with equal weighting between the lower and upper bounds of the p-box). (c) The *medium confidence* mean (the mean of workflows 1e and 2e), the *low confidence* outer bound, and the fusion (which combines these distributions using the weighting function shown in Figure 3).

single Antarctic ice sheet model (DeConto et al., 2021) that includes a representation of marine ice cliff instability (MICI; Pollard et al., 2015). Workflow 4 uses different Antarctic and Greenland ice sheet components, both derived from structured expert judgment (Bamber et al., 2019). The structured expert judgment approach differs from that of an expert survey (Horton et al., 2020), which is not used here.

AR6 distinguishes between better-understood *medium confidence* processes, which can be explored using multi-model ensembles such as ISMIP6, and poorly-understood *low confidence* processes, such as MICI (Fox-Kemper et al., 2021; Kopp, Oppenheimer, et al., 2023; Slangen et al., 2023). Workflows 1e and 2e are categorized as *medium confidence* projections; workflows 3e and 4 are categorized as *low confidence* projections (Fox-Kemper et al., 2021; Kopp, Garner, et al., 2023).

2.2. Existing Approaches: Quantile Functions, p-Box, Bounds, and Effective Distribution

We define each probability distribution as a quantile function. A quantile function maps probability to values. A quantile function is the inverse of a cumulative distribution function, which maps values to probability. Following the IPCC AR6 sea-level projections (G. G. Garner et al., 2021), we use non-parametric quantile functions, defined at the following probabilities: 0.00 to 1.00 with an interval of 0.01 (corresponding to each integer percentile) and also at 0.001, 0.005, 0.995, and 0.999 (corresponding to the 0.1st, 0.5th, 99.5th, and 99.9th percentiles).

A p-box (probability box) is an envelope that spans the range of multiple quantile functions (Kopp, Oppenheimer, et al., 2023; Le Cozannet et al., 2017). The range across the p-box indicates ambiguity (Kopp, Oppenheimer, et al., 2023), “what is unknown” (Rohmer et al., 2019). There is no upper limit on the number of quantile functions that can be used to construct a p-box. In this paper, we construct the p-box using four quantile functions that correspond to the workflows described above: workflows 1e, 2e, 3e, and 4 (Figure 2b). This approach corresponds to the *low confidence* p-box of AR6 (Fox-Kemper et al., 2021).

The p-box is bounded by two quantile functions: a lower bound and an upper bound (Le Cozannet et al., 2017). The lower bound (L) corresponds to the minimum of the four workflows at each probability level ($0 \leq p \leq 1$):

$$L(p) = \min\{W_1(p), W_2(p), W_3(p), W_4(p)\} \quad (1)$$

where W_1 , W_2 , W_3 , and W_4 refer to the quantile functions of workflows 1e, 2e, 3e, and 4. Similarly, the upper bound (U) corresponds to the maximum of the four workflows:

$$U(p) = \max\{W_1(p), W_2(p), W_3(p), W_4(p)\} \quad (2)$$

Following the IPCC AR6 sea-level projections, we derive a *low confidence* outer bound (B) using the upper bound for probabilities above the median and the lower bound for probabilities below the median:

$$B(p) = \begin{cases} U(p), & 0.5 < p \leq 1 \\ \text{undefined}, & p = 0.5 \\ L(p), & 0 \leq p < 0.5 \end{cases} \quad (3)$$

At the median ($p = 0.5$), we adopt a convention that the median is undefined. This differs from the convention followed by the IPCC AR6 projections, where the median is defined as the mean of the medians across the workflows (G. G. Garner et al., 2021). Either way, the outer bound is not continuous across the median (Figure 2b). This discontinuity informs our decision to specify the median as undefined.

The effective distribution (E_a) is a weighted mean of the upper and lower bounds:

$$E_a(p) = a \cdot U(p) + (1 - a) \cdot L(p) \quad (4)$$

where the constant weight a ($0 \leq a \leq 1$) corresponds to a decision-maker's degree of ambiguity aversion (Dubois & Guyonnet, 2011; Rohmer et al., 2019). The choice of weight a is subjective (Dubois & Guyonnet, 2011). Here, we aim to provide an ambiguity-neutral estimate of the scientific uncertainty. Therefore, we show results for $a = 0.5$ (Rohmer et al., 2019): the ambiguity-neutral effective distribution ($E_{0.5}$) is the mean of the lower and upper bounds (Figure 2b). However, even this 'neutral' choice is subjective and may not align with the ambiguity aversion of a downstream decision-maker.

2.3. Fusion

We aim to provide a best estimate of the scientific uncertainty by considering the complementary strengths of the alternative workflows. Our proposed fusion is a quantile-dependent weighted-mean of other quantile functions. To identify these quantile functions, we ask two questions.

First, which quantile function do we assess to be most reliable in the center of the distribution? In other words, which quantile function provides the best estimate of the most-likely central possibilities? The two *medium confidence* workflows are strong candidates. Multi-model ensembles—such as ISMIP6—may skilfully represent many important ice sheet processes, enabling these ensembles to explore the uncertainty associated with these *medium confidence* processes (Goelzer et al., 2020; Payne et al., 2021). We therefore assume that the *medium confidence* workflows reliably sample the most-likely central possibilities, an assumption consistent with AR6 (Fox-Kemper et al., 2021). We have no preference between the two *medium confidence* workflows. Therefore, instead of selecting a single workflow, we choose to use the *medium confidence* mean (M), the mean of the quantile functions of workflows 1e and 2e:

$$M(p) = \frac{W_1(p) + W_2(p)}{2} \quad (5)$$

Second, which quantile function do we assess to be most reliable in the tails of the distribution? In other words, which quantile function provides the best estimate of the unlikely tail possibilities? The *low confidence* outer bound (B) is the strongest candidate. The outer bound incorporates uncertainty from all four workflows, including the *low confidence* workflows that account for poorly-understood ice sheet processes that increase the scientific uncertainty. In contrast, the *medium confidence* workflows may underestimate the full range of scientific uncertainty (Aschwanden et al., 2021).

Having answered these questions, we use a weighting function (w) to construct the fusion (F) using the quantile functions of the *medium confidence* mean (M) and the *low confidence* outer bound (B):

$$F(p) = w(p) \cdot M(p) + (1 - w(p)) \cdot B(p) \quad (6)$$

We now ask, what function should we choose for the weighting function (w)? Considering our assumptions, we seek a quantile-dependent weighting function that prioritizes the *medium confidence* mean in the center of the distribution and *low confidence* outer bound in the tails. A simple option would be to use a triangular weighting

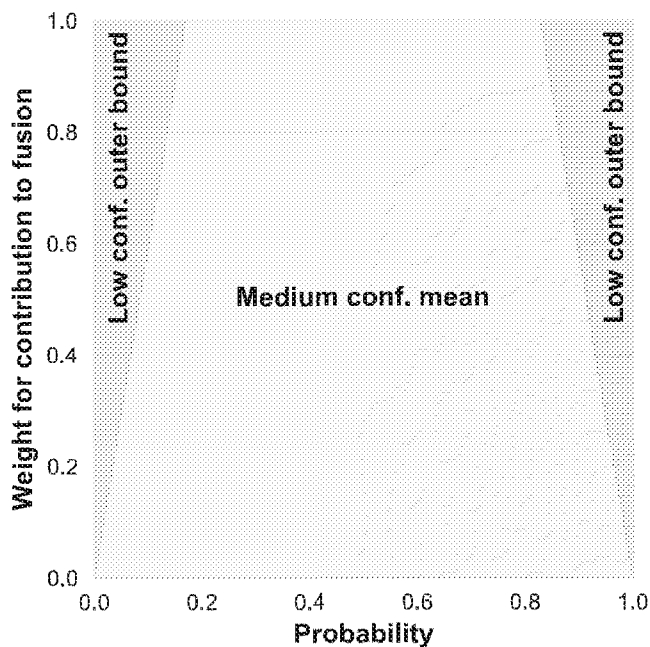


Figure 3. The trapezoidal weighting function (Equation 7) that combines the quantile functions of the *medium confidence* mean and the *low confidence* outer bound to produce the fusion (Equation 6).

function. However, to maintain consistency with the *likely* range of AR6 (Fox-Kemper et al., 2021; Kopp, Oppenheimer, et al., 2023), we use a trapezoidal weighting function (Figure 3):

$$w(p) = \begin{cases} \frac{1-p}{0.17}, & 0.83 < p \leq 1 \\ 1, & 0.17 \leq p \leq 0.83 \\ \frac{p}{0.17}, & 0 \leq p < 0.17 \end{cases} \quad (7)$$

In other words, the fusion follows the *medium confidence* mean between the 17th and 83rd percentiles and transitions smoothly to the *low confidence* outer bound in the tails. This is approximately consistent with the *likely* range of AR6, which was derived from the *medium confidence* outer bound (not the *medium confidence* mean). By assigning all the weight to the *medium confidence* mean in the center of the distribution, we avoid the discontinuity in the outer bound. This ensures that the fusion is continuous (Figure 2c). We also note that the *medium confidence* mean is contained within the p-box from which the outer bound is constructed. This ensures that the fusion is monotonic.

The fusion differs from a mixture distribution consisting of a weighted-mean of cumulative distribution functions. We have chosen to mix the quantile functions instead, because a quantile-dependent weighted-mean of quantile functions more accurately reflects our assumptions about the complementary strengths of the *medium confidence* and *low confidence* workflows.

3. Results

3.1. Alternative Workflows, p-Box, and Outer Bound

Model ambiguity drives uncertainty *within* each workflow (Figure 2a). For example, the ice sheet components of workflow 1e are derived from an ensemble of multiple ice sheet models. We do not know which model provides the most accurate description of real ice sheet behavior. By sampling multiple models through subjective averaging, workflow 1e effectively treats the multi-model ensemble as a proxy for scientific uncertainty.

Method ambiguity drives difference *between* workflows (Figure 2a). For example, *medium confidence* model-based and *low confidence* expert-based projections of ice sheet mass loss differ markedly, driving differences between workflows 1e and 4: workflow 4 has a higher median and covers a much wider uncertainty range. The *low confidence* p-box quantifies the method ambiguity (Figure 2b).

The *low confidence* outer bound is discontinuous at the median (Figure 2b). The discontinuity corresponds to a gap in the probability density function (Figure 4). Due to the discontinuity, the outer bound is not a well-behaved probability distribution.

3.2. Fusion

To provide a best estimate of the scientific uncertainty, the fusion combines information from the *medium confidence* and *low confidence* workflows. The fusion follows the *medium confidence* mean in the center of the distribution, whilst simultaneously incorporating the thick upper tail of the *low confidence* outer bound (Figures 2c and 4).

The fusion differs from the outer bound and the effective distribution. In contrast to the outer bound, the fusion is a well-behaved probability distribution, with no discontinuity at the median (Figure 2c). In contrast to the ambiguity-neutral effective distribution, the fusion has a lower median yet also has thicker tails, because it incorporates the full uncertainty range of the outer bound (Fig. S1 in Supporting Information S1).

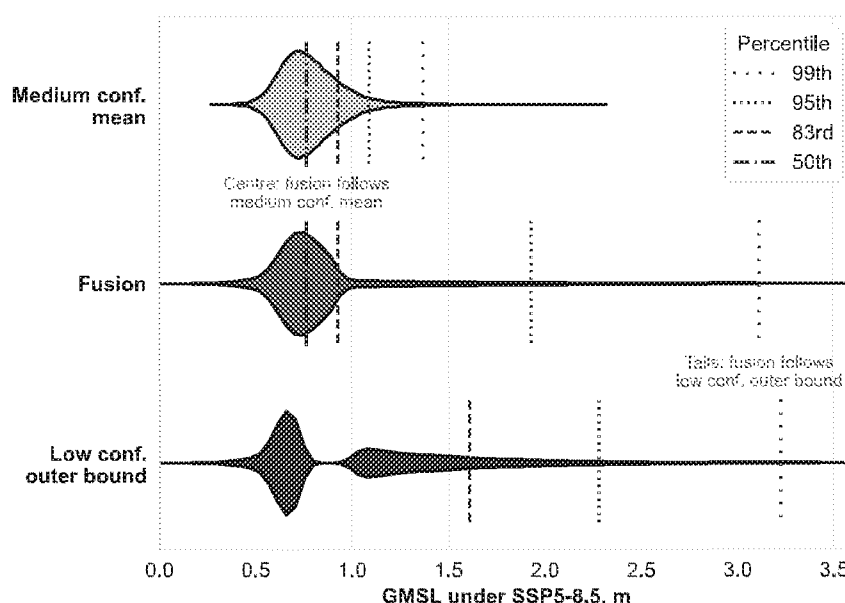


Figure 4. Probability density functions of GMSL in 2100 under SSP5-8.5. Each probability density function is derived from the corresponding quantile function using Monte Carlo sampling (with 1 million random samples drawn from a uniform distribution of probabilities) and is plotted as a kernel density estimate (using Scott's rule for bandwidth selection and limiting the range to that of the samples). The median, 83rd, 95th, and 99th percentiles are indicated by vertical lines. The median of the *low confidence* outer bound is undefined.

As a probabilistic projection, the fusion provides probabilistic answers. For example, the probability of GMSL exceeding 1.0 m by 2100 is 4% under the low-emissions SSP1-2.6 scenario (Figure 5). Under the high-emissions SSP5-8.5 scenario, the probability increases substantially to 16%. These precise probabilities summarize our best estimate of the scientific uncertainty. In contrast, the lower and upper bounds of the p-box quantify method ambiguity: across the four alternative workflows, the probability of GMSL exceeding 1.0 m ranges from 0% to 7% under SSP1-2.6 and from 2% to 51% under SSP5-8.5 (Figure 5).

3.3. Median, Likely Range, Very Likely Range, and High-End Projection

The fusion provides a median projection (50th percentile), *likely* range (17th–83rd percentiles), *very likely* range (5th–95th percentiles), and high-end projection (95th percentile) that are consistent with our assumptions about the complementary strengths of the alternative workflows. For GMSL in 2100 under SSP1-2.6, the median is 0.4 m, the *likely* range is 0.3–0.6 m, and the *very likely* range is 0.3–1.0 m (Figure 6a; Table 1). Under SSP5-8.5, the median is 0.8 m, the *likely* range is 0.6–0.9 m, and the *very likely* range is 0.5–1.9 m (Figure 6b; Table 1). For both scenarios, the *likely* range and median follow the *medium confidence* mean (Fig. S2 in Supporting Information S1). The *very likely* range falls between the 5th–95th percentile ranges of the *medium confidence* mean and the *low confidence* outer bound (Fig. S2 in Supporting Information S1).

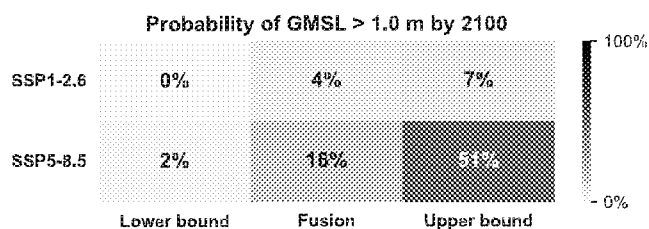


Figure 5. Probability of GMSL exceeding 1.0 m by 2100. Results are shown for the fusion, the lower bound of the *low confidence* p-box, and the upper bound, under both SSP1-2.6 and SSP5-8.5.

A high-end projection can be derived from the upper end of the *very likely* range (95th percentile). For GMSL in 2100 under SSP5-8.5, this high-end projection is 1.9 m. This falls between the 83rd and 95th percentiles of the *low confidence* outer bound (1.6 and 2.3 m; Fig. S2 in Supporting Information S1).

4. Discussion

4.1. A Best Estimate of Scientific Uncertainty

The fusion provides an informed best estimate of scientific uncertainty, described probabilistically. To provide this best estimate, we have made transparent assumptions about the complementary strengths of existing projection workflows.

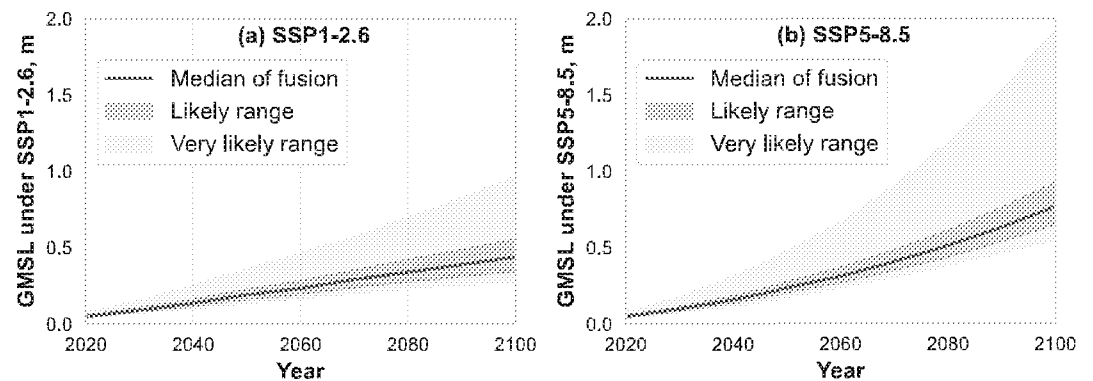


Figure 6. Median, *likely* range, and *very likely* range of GMSL, derived from the fusion under two emissions scenarios: (a) SSP1-2.6; (b) SSP5-8.5.

The fusion integrates information from models and experts. Expert judgment is necessary and valuable, informing model building, model evaluation, and the quantification of scientific uncertainty (Majszak & Jebeile, 2023). Climate scientists are the experts who are most qualified to characterize, assess, and convey the scientific uncertainty associated with climate change (Fischhoff & Davis, 2014). Accordingly, expert judgment is integral throughout the process of producing probabilistic projections (Figure 1; Majszak & Jebeile, 2023). We have proposed an additional layer of expert judgment in which experts consider the complementary strengths of alternative projections and identify a corresponding weighting function to produce the fusion. This additional layer of expert judgment could be provided by assessment panels, such as the IPCC. We anticipate, however, that consensus may pose a major challenge: Can the panel reach consensus on assumptions about the strengths of alternative projections and the corresponding weighting function to use? For example, experts may disagree about which projections to use for the most-likely central possibilities. One possible solution would be to use a weighted mean of alternative *medium confidence* workflows, with the weights determined by the votes of different experts.

The fusion is consistent with a Bayesian interpretation of probability. A probabilistic projection describes scientific uncertainty (Millner et al., 2013), a type of epistemic uncertainty (Dubois & Guyonnet, 2011; Hinkel et al., 2021; Shepherd, 2019): we possess only incomplete and imprecise knowledge of the physical climate system. A probabilistic projection must therefore be interpreted from a Bayesian (or “subjective”) perspective: the probability distribution represents “degrees of belief” about possible future outcomes (Hájek, 2019). These degrees of belief are conditioned on the assumptions and methods used to construct the probabilistic projection. Although a probabilistic projection may misrepresent the uncertainty when misinterpreted (Katzav et al., 2021), we would argue that probabilistic projections remain both justifiable and useful. Although a probability distribution derived from climate models may be distorted, this does not mean that we should abandon a probabilistic approach—idealized models can still provide valuable information about the real world (Dethier, 2023).

The fusion represents model ambiguity and method ambiguity consistently. Both model ambiguity and method ambiguity are represented probabilistically. This contrasts with the approach adopted in AR6 (Fox-Kemper et al., 2021), where model ambiguity was represented probabilistically within each workflow while method ambiguity was represented using p-boxes.

Table 1
Comparison of Published Projections of GMSL in 2100

Source	GMSL in 2100 under SSP1-2.6, m			GMSL in 2100 under SSP5-8.5, m			
	Median	Likely range	Very likely range	Median	Likely range	Very likely range	High-end projection
Fusion	0.4	0.3–0.6	0.3–1.0	0.8	0.6–0.9	0.5–1.9	1.9
IPCC AR6 <i>medium confidence</i> (Fox-Kemper et al., 2021)	0.4	0.3–0.6		0.8	0.6–1.0		
IPCC AR6 <i>low confidence</i> (Fox-Kemper et al., 2021)				0.9	0.6–1.6		1.6 (83rd percentile) 2.3 (95th percentile)
van de Wal et al. (2022)							1.6

The fusion complements and builds on the p-box approach. A p-box excels at emphasizing ambiguity. The existence of both a *medium confidence* p-box and a *low confidence* p-box in AR6 communicates an additional layer of ambiguity. However, the substantial ambiguity communicated by the p-boxes may hinder decision-making (Rohmer et al., 2019). Furthermore, although the p-box is not a probabilistic projection, there is a danger that users may misinterpret the outer bound as a precise probabilistic projection (cf. van der Pol & Hinkel, 2019). Additionally, the discontinuity in the outer bound can influence downstream results, such as the projected timing of decreased coastal protection (Hermans et al., 2023). In contrast to the outer bound, the fusion is a probabilistic projection and is continuous. We propose that climate scientists consider using both the p-box and the fusion: the p-box quantifies method ambiguity, while the fusion quantifies a best estimate of scientific uncertainty, conditioned on the scientists' assumptions.

The fusion complements and supports a storyline approach. A physically self-consistent storyline (Shepherd, 2019; Shepherd et al., 2018) can be referenced to a specific percentile of a probabilistic projection (Palmer et al., 2024). For example, we could develop a high-end sea-level storyline based on the 95th percentile of the fusion under SSP5-8.5.

4.2. Comparison With Other Projections

Importantly, the fusion provides a meaningful median (50th percentile), *likely* range (17th–83rd percentiles), *very likely* range (5th–95th percentiles), and high-end projection (95th percentile). Although any probabilistic projection can provide percentile ranges, the ranges are only meaningful if we trust the general reliability of the projection at those percentiles. Scientists must therefore consider their degree of trust in the underlying methods and assumptions, including our assumptions about the complementary strengths of the alternative workflows. If the fusion provides an informed best estimate of scientific uncertainty in both the center and the tails of the distribution, then the fusion provides a meaningful median, *likely* range, *very likely* range, and high-end projection.

These ranges can be interpreted as credible intervals. This differs slightly from the “imprecise” *likely* range of AR6, which was derived from the *medium confidence* outer bound (Fox-Kemper et al., 2021; Kopp, Oppenheimer, et al., 2023). Nevertheless, the fusion's median and *likely* range are very similar to those of the IPCC AR6 *medium confidence* projections (Table 1). In contrast, the *very likely* range is novel. By providing a meaningful *very likely* range, the fusion addresses the absence of a *very likely* range in AR6 (Fox-Kemper et al., 2021, p. 1298).

Under SSP5-8.5, the fusion's high-end projection is 1.9 m in 2100 (Table 1). This falls between the IPCC AR6's high-end projections of 1.6 and 2.3 m, which were derived from the 83rd and 95th percentiles of the *low confidence* outer bound. The fusion's high-end projection of 1.9 m is a little higher than van de Wal et al. (2022)'s high-end projection of 1.6 m, which was based on expert judgment of available evidence. In general, published high-end projections vary widely: A. J. Garner et al. (2018) reported that the range of published “upper projections” has expanded to 0.5–2.5 m since 2013. The fusion's high-end projection falls well within this range.

4.3. Meeting the Needs of Diverse Users

The fusion caters to diverse users with differing levels of uncertainty tolerance (Blankespoor et al., 2023; Hinkel et al., 2019). The assessment of scientific uncertainty is entrusted to sea-level scientists who can make informed choices about the complementary strengths of alternative projections. The downstream user only needs to choose which percentiles to use, supporting usability. Even though coastal practitioners may consider only a small number of decision-oriented scenarios (A. J. Garner et al., 2023; Hirschfeld et al., 2023), such scenarios can be derived from the fusion by selecting specific percentiles (Kopp, Oppenheimer, et al., 2023). For example, the 95th percentile is useful when planning activities with low uncertainty tolerance (New Jersey Department of Environmental Protection, 2021). The fusion also caters to users who require a full probability distribution of scientific uncertainty (Fischhoff & Davis, 2014; Rasmussen et al., 2020). For example, the fusion could facilitate more accurate estimation of coastal adaptation costs (Wong et al., 2022).

However, users must remember that sea-level projections remain subject to ambiguity (Kopp, Oppenheimer, et al., 2023). To quantify the influence of the method ambiguity, users can conduct sensitivity tests using the lower and upper bounds of the p-box. Alternatively, users may choose to adopt a “multiple priors” approach

(Hansen, 2014; Heal & Millner, 2014), treating the fusion as a “benchmark” projection (Text S1 in Supporting Information S1; Hansen, 2014). To communicate method ambiguity, we recommend that assessment panels publish either the p-box or individual workflows alongside the fusion.

Users must also remember that the fusion describes scientific uncertainty. The fusion does not describe other policy-relevant categories of uncertainty (Millner et al., 2013). The fusion does not incorporate decision-makers’ values (Fischhoff & Davis, 2014). The fusion does not circumvent the need for local contextualization of sea-level assessments (Blankespoor et al., 2023). Beyond assessment, other aspects of the coastal adaptation cycle—planning, implementation, and monitoring—are essential and require further research (Cabana et al., 2023). Diverse disciplinary experts, practitioners, and local stakeholders offer complementary perspectives that can enrich sea-level science, enabling usability (Durand et al., 2022; Kopp et al., 2019).

5. Conclusions

Sea-level projections must cater to users with diverse needs and differing tolerance for uncertainty. Although many users may choose to use a single estimate of sea-level rise, the sea-level science community can simplify the choice by providing a single probabilistic projection from which users can select their preferred percentiles according to their uncertainty tolerance. We have proposed that this single probabilistic projection can be a fusion of alternative probabilistic projections. To produce the fusion, we have considered the complementary strengths of alternative projections. The fusion is an informed best estimate of scientific uncertainty, quantified using a probability distribution. Beyond quantification of uncertainty, the fusion also supports communication of uncertainty. The fusion caters to diverse users by providing meaningful information in both the center and the tails of the distribution.

The fusion will need to be updated periodically. We have demonstrated the fusion approach using the current generation of projections used by the IPCC (Fox-Kemper et al., 2021). As sea-level science, observations, and projections continue to evolve (A. J. Garner et al., 2018; Slangen et al., 2023), climate scientists will need to reconsider the strengths of alternative projections.

The fusion approach could be applied in various ways beyond those demonstrated here. We could produce a fusion using two or more alternative probabilistic projections of any variable. For example, we could produce a fusion that combines alternative probabilistic projections of Greenland ice sheet mass loss, vertical land movement, or global mean surface temperature. Most intriguingly, we could produce a fusion that combines alternative emissions scenarios. We intend to explore this topic further in future research.

Data Availability Statement

We downloaded the IPCC AR6 sea-level projections from <https://doi.org/10.5281/zenodo.6382554> (G. G. Garner et al., 2021). We have published our analysis and figure-production code at <https://doi.org/10.5281/zenodo.13627262> (Grandey, 2024).

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Acknowledgments

This Research/Project is supported by the National Research Foundation, Singapore, and National Environment Agency, Singapore under the National Sea Level Programme Funding Initiative (Award USS-IF-2020-3). BPH was also supported by Singapore Ministry of Education (MOE) Academic Research Fund Tier 3 Project MOE-2019-T3-1-004. We thank the projection authors for developing and making the sea level rise projections available, multiple funding agencies for supporting the development of the projections, and the NASA Sea Level Change Team for developing and hosting the IPCC AR6 Sea Level Projection Tool. BSG thanks Robert Kopp for providing helpful advice about the IPCC AR6 projections data. BSG thanks Dhrubajyoti Samanta, Jennifer Weeks, Trina Ng, Nidheesh Gangadharan, and Steven Sherwood for helpful discussions. This work comprises Earth Observatory of Singapore contribution number 629.

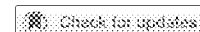
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ARTICLE OPEN



Estimating global mean sea-level rise and its uncertainties by 2100 and 2300 from an expert survey

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Sea-level rise projections and knowledge of their uncertainties are vital to make informed mitigation and adaptation decisions. To elicit projections from members of the scientific community regarding future global mean sea-level (GMSL) rise, we repeated a survey originally conducted five years ago. Under Representative Concentration Pathway (RCP) 2.6, 106 experts projected a likely (central 66% probability) GMSL rise of 0.30–0.65 m by 2100, and 0.54–2.15 m by 2300, relative to 1986–2005. Under RCP 8.5, the same experts projected a likely GMSL rise of 0.63–1.32 m by 2100, and 1.67–5.61 m by 2300. Expert projections for 2100 are similar to those from the original survey, although the projection for 2300 has extended tails and is higher than the original survey. Experts give a likelihood of 42% (original survey) and 45% (current survey) that under the high-emissions scenario GMSL rise will exceed the upper bound (0.98 m) of the likely range estimated by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, which is considered to have an exceedance likelihood of 17%. Responses to open-ended questions suggest that the increases in upper-end estimates and uncertainties arose from recent influential studies about the impact of marine ice cliff instability on the meltwater contribution to GMSL rise from the Antarctic Ice Sheet.

npj Climate and Atmospheric Science (2020)3:18; <https://doi.org/10.1038/s41612-020-0121-5>

INTRODUCTION

Variability of global mean sea-level (GMSL) projections among studies, even when using the same emissions scenarios, has led to confusion among decision-making communities and the public^{1,2}. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) projected GMSL by summing the contributions from physical processes to provide a likely (i.e., central 66% probability; see exegesis by ref. ³) estimate of GMSL rise of 0.52–0.98 m in the case of unmitigated growth of emissions (Representative Concentration Pathway [RCP] 8.5) by 2100, relative to 1986–2005⁴. However, substantial uncertainties surrounding the response of the Greenland and Antarctic Ice Sheets to dynamic processes such as marine ice sheet instability (MISI) and marine ice cliff instability (MICI)^{5,6} indicate that the physical models used in process-based predictions of GMSL rise are incomplete⁷. Indeed, AR5 noted that additional GMSL rise up to several decimeters was possible due to MISI, but it was not included in the estimate of Antarctic Ice Sheet rapid dynamics due to likelihood of such a contribution being unquantified⁴. The recent IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)⁸ included MISI (but not MICI). Consequently, estimates from SROCC for 2100 under RCP 8.5 are higher and the likely range larger than in AR5 (0.61–1.10 m). The majority of individual studies published since 2013 for high emission scenarios project GMSL rise >1 m by 2100¹, including several that suggest the possibility of a rise >2 m^{9,10}, in line with projections of semiempirical models^{11–14}.

As an alternative to models, GMSL rise may be projected by surveying experts^{15–17}. Broadly, two different approaches have

been used to extract estimates of the likelihood of future GMSL from experts in the field. Structured expert judgment is a formal method in which a small number of experts are guided in the interpretation of probabilities in a workshop setting before having their responses weighted based on their performance on calibration questions. This method was used to assess the probability distribution of future ice-sheet changes^{15,16}. More informal approaches, also known as “broad” elicitations or expert (surveys), ask many experts a small number of questions, aiming for wide participation by minimizing the required time investment for participation. Broad elicitations are appropriate for interdisciplinary problems that involve large uncertainties such as sea-level projection¹⁸. We previously surveyed experts¹⁷ (hereafter H14) to provide a probabilistic assessment of sea-level rise by 2100 and 2300 under two contrasting temperature scenarios.

Now is an appropriate time to repeat the survey of H14 because during the past five years, progress has been made in better understanding several processes expected to influence GMSL rise (e.g., MICI) and in advancing the methodologies for projecting GMSL rise. We retain the same aim as the original study: to survey experts in the scientific community about how much GMSL change they anticipate for two time periods (2000–2100 and 2000–2300) under two temperature scenarios (derived from the upper and lower extremes of the RCP 2.6 and RCP 8.5 scenarios; Fig. 1). We also inquire about the sources of experts’ uncertainties when projecting GMSL. The results of this survey (hereafter H20) are compared with the H14 survey results and published literature to assess how and why the sea-level community’s projections evolved during the past 5 years and if there is movement toward a

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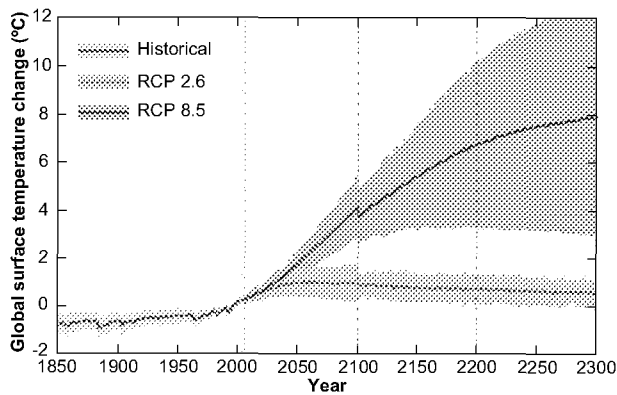


Fig. 1 Time series of global annual mean surface air temperature anomalies (relative to 1886–2005) from CMIP5 concentration-driven experiments, modified from IPCC AR5.4. These temperature projections correspond to the lower (RCP 2.6; blue) and upper (RCP 8.5; red) greenhouse gas scenarios included in the Representative Concentration Pathways (RCP) and their extension to 2300. Projections for each RCP show the multi-model mean (solid lines) and the 5–95% range across the distribution of individual models (shading). Note the discontinuities at 2100 are due to the different number of models that perform extension runs beyond the 21st century (and have no physical meaning).

consensus of GMSL rise for 2100 and 2300 under different emission scenarios. These expert projections provide a new estimate of GMSL rise that can be used by decision makers¹⁹, where uncertainties accurately reflect current scientific knowledge.

RESULTS

Sea-level experts

The H14 survey identified the 500 individuals who (co-)authored the most publications on the subject of sea level during the period 2009–2013. This cohort of experts published a minimum of six papers (mean of 8.6 with a standard deviation of 3.3 and maximum of 33). In this survey, we retained the definition of an expert as someone who published at least six papers over the period 2014–2018 and 878 individuals met this criterion (mean of 11.5 publications with a standard deviation of 5.7 and maximum of 55). The number of papers published annually on the topic of “sea level” (term appearing in the title or listed as a keyword) more than doubled between 2009 and 2018 from 869 to 2012 (Fig. 2a; see “Methods”). The subset of these papers containing the term “sea level” in the title almost doubled over the same period from 279 to 527. Notably, there was a spike in the number of papers published in 2013 that we attribute to authors completing publications in time for them to be incorporated in IPCC AR5. According to ref.²⁰, the recent annual growth rate for publications

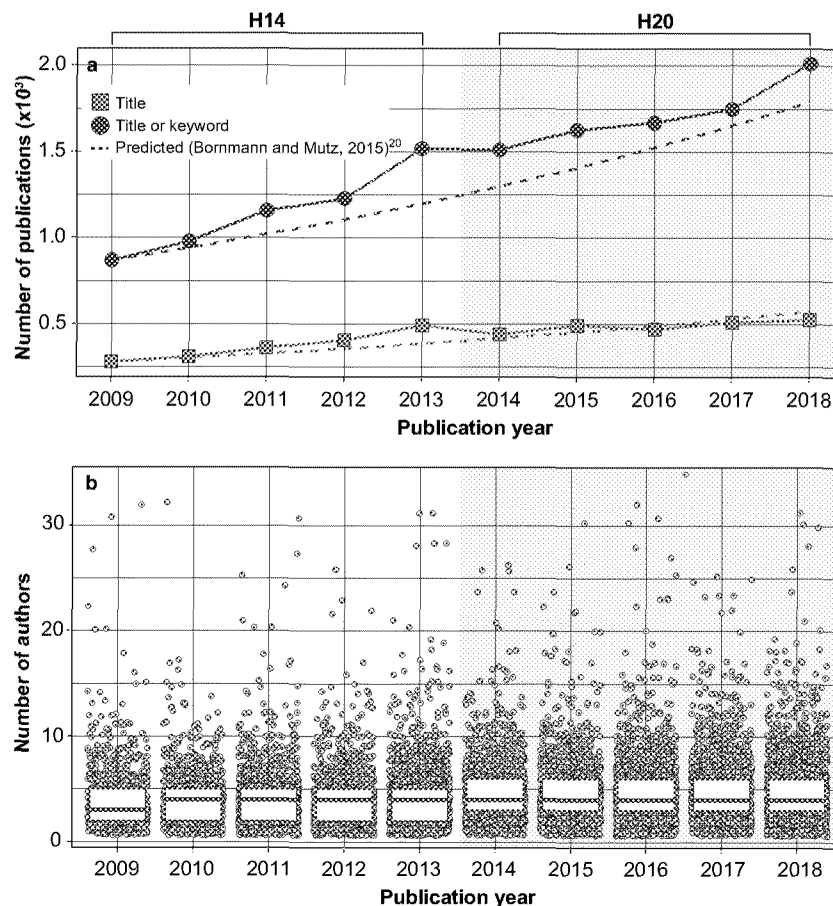


Fig. 2 Publishing trends in sea-level research between 2009 and 2018 summarized from papers included in the Web of Science. **a** Total number of papers published annually where the term “sea level” (and common variants) appears in the title of the paper (blue squares) and/or in the keywords (author defined or KeyWord Plus; red circles). For comparison, we predicted the number of papers published in each year since 2009 using an annual growth rate of 8.4%, which is the recent trend in natural science fields (ref.²⁰; dashed lines). **b** Number of (co) authors on sea-level publications (gray circles). Box plots represent the median (solid horizontal line), 25th and 75th percentiles (hinges), and the largest value no further than 1.5 times the interquartile range from the hinge (~95% confidence interval for comparing medians; whiskers).

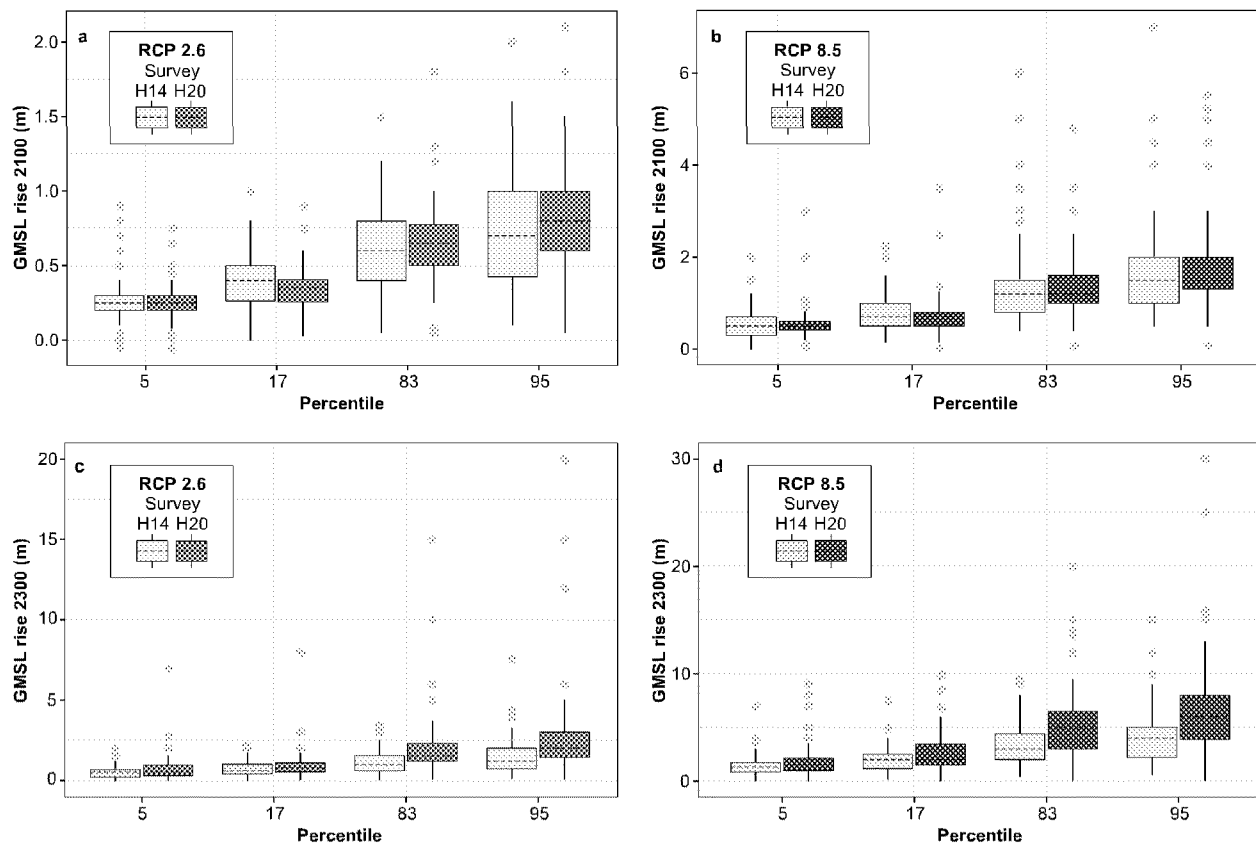


Fig. 3 Box plots of H14 and H20 surveys of global mean sea-level rise across all experts who provided at least partial responses to questions. Participants in both surveys were asked to estimate likely (17th to 83rd percentiles) and very likely (5th to 95th percentiles) sea-level rise under two temperature scenarios and at two time points (2100 and 2300), resulting in four sets of responses. Shaded boxes represent the range between the first and third quartiles of responses. Dashed horizontal line within the box is the median response. Whiskers (solid lines) represent two standard deviations of the responses. Filled circles show individual responses that are beyond two standard deviations of the median.

in the natural sciences is 8.4%. Therefore, growth in the number of publications about sea level is similar to wider publication trends in the natural sciences (Fig. 2a). The number of authors on sea-level papers is highly variable among publications, but shows a modest increase through time (Fig. 2b). The mean number of authors by year between 2009 and 2013 was 4.1 to 4.5, while between 2014 and 2018 it ranged from 4.7 to 5.2. We therefore conclude that the increase in the number of individuals who (co-) authored six or more publications about sea level in a 5-year period from H14 to H20 arose principally from a growing number of scientific papers published annually, but also because the average number of (co-)authors on sea-level papers increased by approximately one between 2009 and 2018.

Estimates of GMSL rise by 2100 and 2300

For GMSL projections, the experts provided two uncertainty ranges and a median estimate for RCP 2.6 (which limits warming to 1 °C by 2100 and 1.2 °C by 2300 relative to 1986–2005), and RCP 8.5 (which limits warming to 4.5 °C by 2100 and 12.6 °C in 2300 relative to 1986–2005). The inner GMSL projection uncertainty range (17th to 83rd percentiles) defines the central 66% probability range of GMSL, which corresponds to the “likely” ranges of GMSL rise provided in IPCC AR5³. The outer range (5th to 95th percentiles) defines the central 90% probability range of GMSL, which corresponds to the “very likely” ranges of GMSL rise provided in IPCC AR5³. Figure 3 presents box plots of the survey results for the 5th, 17th, 83rd, and 95th percentiles across all respondents ($n=106$) to provide an overview of the variability in the quantitative information provided by the survey. Expert projections also informed probability density

functions (PDFs; see Supplementary Information) whereby the expert percentile estimates are assumed to have been derived through a hierarchical structure from a latent distribution that provides the relative likelihood of GMSL under RCP 2.6 and RCP 8.5 by 2100 and 2300 (Fig. 4; Supplementary Information).

Under RCP 2.6, the PDFs suggest a likely range of GMSL rise of 0.30–0.65 m, a very likely range of 0.21–0.82 m, and a median of 0.45 m by 2100. By 2300, the PDFs suggest a likely range of GMSL rise of 0.54–2.15 m, a very likely range of 0.24–3.11 m, and a median of 1.18 m (Table 1).

Under RCP 8.5, the likely range of GMSL rise is 0.63–1.32 m, the very likely range is 0.45–1.65 m, and the median is 0.93 m by 2100. By 2300, the likely range is 1.67–5.61 m, the very likely range is 0.88–7.83 m, and the median is 3.29 m (Table 1).

We found no relationship between experts’ GMSL projections and their self-reported career stage, discipline, or geographic location (Supplementary Information and Supplementary Figs. 1–3), which repeats the findings of H14. This is an important test for expert surveys, because it can reveal differences among the views of experts with different degrees of expertise, experience, or scientific standing.

DISCUSSION

Expert projections

A recent structured expert judgment¹⁵, focusing on ice sheet contributions to GMSL presented a likely range of 0.8–1.7 m, and a very likely range of 0.6–2.4 m for GMSL rise in 2100 under a high emission scenario that is roughly comparable to RCP 8.5. There are

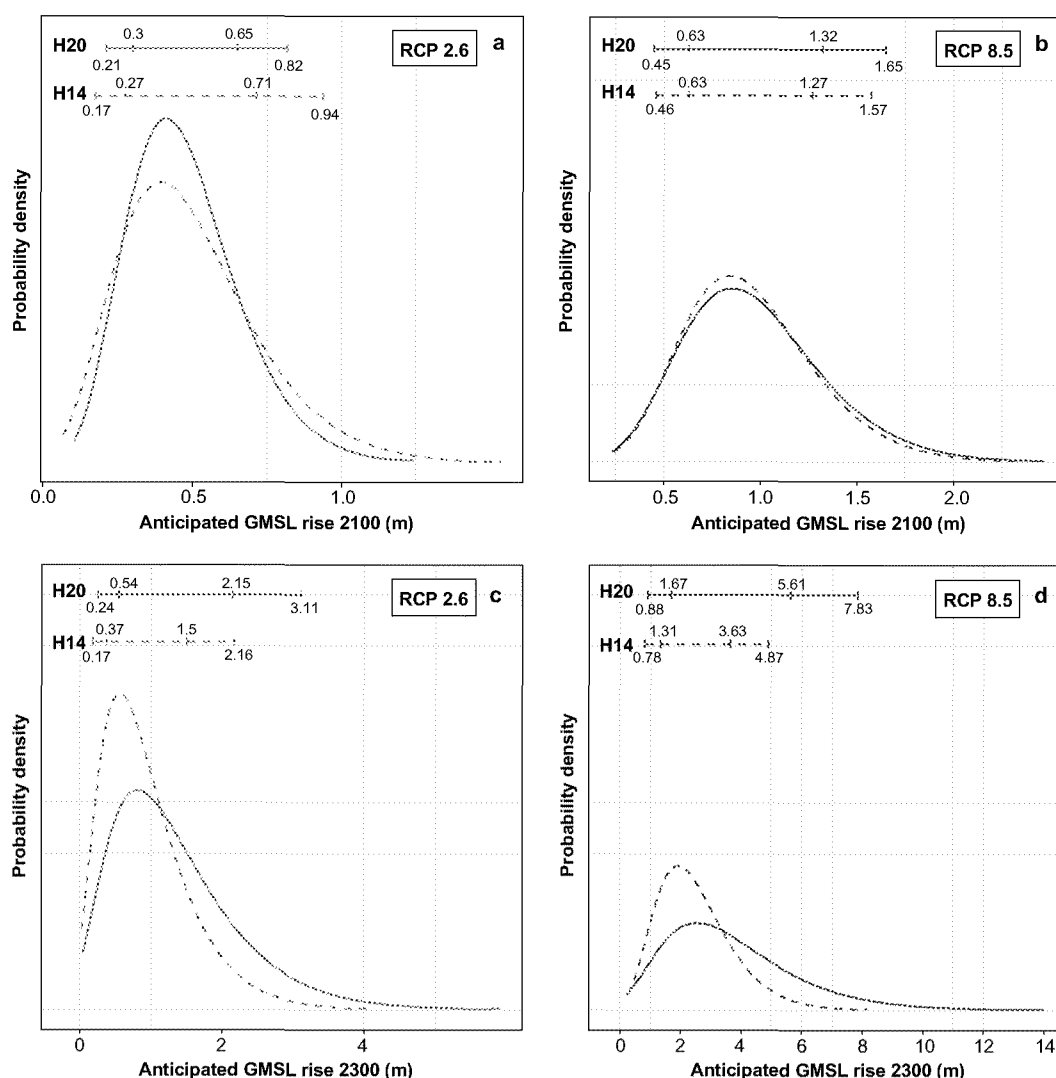


Fig. 4 Probability density functions (PDFs) of H14 (dashed) and H20 (solid) surveys of global mean sea-level rise for RCP 2.6 (blue) and RCP 8.5 (red) greenhouse gas scenarios. The horizontal bars show the 5th, 17th, 83rd, and 95th percentile values.

Table 1. The “likely” ranges and “very likely” ranges of global mean sea-level rise for 2100 and 2300 using an expert survey.					
Survey	Year	Scenario	Likely range (m) (17th to 83rd percentiles)	Median (m) (50th percentile)	Very likely range (m) (5th to 95th percentiles)
2020 Survey	2100	Lower (RCP 2.6)	0.30–0.65	0.45	0.21–0.82
		Upper (RCP 8.5)	0.63–1.32	0.93	0.45–1.65
	2300	Lower (RCP 2.6)	0.54–2.15	1.18	0.24–3.11
		Upper (RCP 8.5)	1.67–5.61	3.29	0.88–7.83
2014 Survey	2100	Lower (RCP 2.6)	0.27–0.71	0.46	0.17–0.94
		Upper (RCP 8.5)	0.63–1.27	0.92	0.46–1.57
	2300	Lower (RCP 2.6)	0.37–1.50	0.81	0.17–2.16
		Upper (RCP 8.5)	1.31–3.63	2.29	0.78–4.87

obvious differences between the ranges derived from the structured expert judgment and our expert survey, particularly in the magnitude of the upper tails of the distributions. The structured expert judgment¹⁵ provided combined ice sheet sea-level rise contributions, which alone show a very likely range of 0.1–1.8 m by 2100 under the high emission scenario. This potentially suggests a difference between GMSL projections from experts with a primary

expertise in ice sheets¹⁵, and GMSL projections from the field more broadly, as in our survey, where there was a relatively equal distribution of respondents with primary expertise in statistical or physical process modeling (32%), data collection or processing (35%), and impacts of sea-level rise (30%). From tiered questions, 13% of respondents in our survey identified ice-sheets as their expertise (Supplementary Information).

Expert projections for 2100 also show differences with peer-reviewed literature regarding sea-level projection studies for 2100 under RCP 8.5. Reference²¹ summarized recent literature projections of GMSL rise for 2100 and 2300. Across RCPs, median projections from peer-reviewed literature for GMSL rise by 2100 range from as low as 0.4 m under RCP 2.6 (e.g., ref.²²) to as high as 1.5 m under RCP 8.5 in simulations allowing for an aggressively unstable Antarctic Ice Sheet¹⁰. Assessing across studies yields at least a 90% probability of a GMSL rise of 0.2–1.0 m under RCP 2.6, and 0.4–2.4 m by 2100 under RCP 8.5²¹.

The expert projections for 2300 also differ from the small number of studies that presented projections this far into the future (e.g., refs.^{9,23,24}). Unsurprisingly, the difference among scenarios is extremely large by 2300—by which time, the extension of RCP 2.6 is characterized by an atmospheric CO₂ concentration lower than today, whereas the extension of RCP 8.5 causes an atmospheric CO₂ concentration of nearly 2000 ppm²⁵. Median estimates from peer-reviewed literature of GMSL rise by 2300 range from 1.0–2.0 m under RCP 2.6 to 3.2–11.7 m under RCP 8.5. Across studies, there is at least a 90% probability of –0.2–4.7 m under RCP 2.6, and 1.0–15.5 m under RCP 8.5²¹.

The wide span of expert projections, particularly for RCP 8.5 in 2300, is immediately apparent and reflects the deep uncertainty in longer-term, high-emissions projections. Reference¹⁵, which saw long upper tails in distributions of total ice sheet contributions to GMSL rise, suggests that the long upper tail behavior reflects expert views that large amplitude, nonlinear instabilities could be triggered at higher temperatures. This viewpoint could be feeding into expert predictions of GMSL rise here also. From open-ended questions, we recorded 162 responses regarding the sources of uncertainty under the time period 2000–2100, and 160 responses under time period 2000–2300 (Supplementary Fig. 4). Under GMSL rise for 2000–2100, ice sheets were the most common source of uncertainty for our experts (81%), followed by model/data limitations (8%), ocean-atmosphere (7%), and anthropogenic uncertainties (4%; see “Methods” for definitions). Under GMSL rise for 2000–2300, ice sheets remained the most common source of uncertainty (76%), followed model/data limitations and ocean-atmosphere uncertainty (both at 6%), and anthropogenic uncertainty (5%).

The Antarctic and Greenland Ice Sheets are the largest potential contributors to GMSL rise, being the largest reservoirs of land-based ice on Earth (e.g., ref.²⁶). Experts who identified the Antarctic Ice Sheet as the greatest source of uncertainty account for 23% of responses for 2100 and 21% for 2300. The contribution from the Antarctic Ice Sheet is dominated by ice dynamic processes because ice shelves melt from below or disintegrate from surface meltwater penetrating crevasses, which reduce buttressing of the outlet glaciers flowing onto the ice shelves (e.g., refs.^{27,28}). The uncertainty arises from an imperfect understanding of Antarctic Ice Sheet processes and the internal variability of climate forcing of the ice sheet²⁹. In particular, experts identified MISI and MICI as challenging to capture accurately in ice sheet models (e.g., refs.^{30,31}). The Greenland Ice Sheet was identified as the greatest source of uncertainty associated with the ice sheet contribution to GMSL for 18% of responses for 2100 and 13% for 2300. Uncertainty of the sea level contribution from the Greenland Ice Sheet is dominated by surface mass balance changes, with elevation and albedo positive feedbacks that amplify surface melting at the margins (e.g., refs.^{32–34}). Experts also attributed uncertainty about the contribution to GMSL rise from ice sheets to the influence of submarine basins, or feedbacks between ice sheets and ocean/climate system (Supplementary Information).

Evolution of sea-level rise estimates and ranges

More than 90 projections of GMSL rise were published since H14¹. We can assess the influence of these publications on the expectations of the sea-level research community by comparing H20 and H14 because the main target questions and the temperature scenarios are identical (Fig. 4 and Table 1). For the 2100 projections of GMSL rise under RCP 2.6 and RCP 8.5, the PDFs display similar distributional forms across both survey years. Notably, the tail of the PDF for RCP 2.6 in H14 extends slightly beyond the corresponding tails in the H20 survey, suggesting a slight increase in certainty about the 2100 GMSL projections among experts for a low-emissions scenario. These findings are consistent with the recently published database of GMSL projections from ref.¹, which illustrated minimal change in the range of projections for 2100 under low-emissions scenarios since 2014.

The differences between the PDFs of H14 and H20 for 2300 projections across survey years are more distinguishable. The H20 results have extended tails and a clear shift upwards in anticipated GMSL rise as compared with H14 (Fig. 4). This is an indication that, although experts appear to be more uncertain about the extent of GMSL rise by 2300, overall projections increased. Similar to the 2100 results, these results appear consistent with recently published literature. Although far more publications focused on projecting GMSL for 2100 than 2300, recent studies suggested ranges of GMSL rise by 2300 that exceed the range provided in IPCC AR5, especially for high-emissions scenarios (e.g., refs.^{9,23,24}). Reference¹⁵ concluded that the uncertainties related to ice sheets (particularly MICI), grew over the last 6 years, and that GMSL rise projections grew accordingly. Such uncertainty is most noticeable in the tails of projections, and on longer time scales (e.g., refs.^{5,19}).

IPCC reports tend to provide intentionally cautious and conservative estimates of GMSL rise¹, rather than focusing on high-end, physically plausible sea-level rise risk³⁵. IPCC AR5 and SROCC projected a likely upper limit of GMSL rise of 0.98 and 1.10 m, respectively, for RCP 8.5 by 2100; there is a corresponding 17% probability that GMSL rise will exceed this estimate⁴. From the PDFs (Fig. 4), we estimate “exceedance probabilities” for H14 and H20, defined as the probability of exceeding the upper bound of the likely range from IPCC AR5 and SROCC. According to the H20 survey PDF, there is a 45% probability that GMSL rise will exceed 0.98 m and a 33% probability that GMSL rise will exceed 1.10 m by 2100 under RCP 8.5. This finding is similar to H14, where the PDF suggests a 42% and 30% probability of exceedance, respectively. The broad elicitations of H14 and H20 suggest expert estimates of GMSL rise in 2100 are often higher than the upper bound of IPCC AR5 and SROCC.

Upper estimates for high emission scenarios

Open-ended questions included in the survey regarding specific resources (e.g., academic literature, government reports, etc.) that were most influential to the professional judgments of the experts (Fig. 5) provide insight into the reasons why such a large proportion of experts believed that the IPCC AR5 and SROCC upper bounds for GMSL under RCP 8.5 would be exceeded by 2100. In total, respondents listed 79 references that influenced their estimates, of which 67 were reported for the 2100 scenario. The most cited reference for both 2100 (19%) and 2300 (13%) was ref.⁵, the only ice-sheet model that incorporates MICI. Reference⁵ postulates that ice cliffs become unstable at elevations higher than ~90 m above sea level, facilitating the collapse of ice sheets during warm periods (the Antarctic Ice Sheet is particularly vulnerable to this process). Reference⁵ suggests that incorporating MICI improves agreement of their model with reconstructions of GMSL during the Last Interglacial, Pliocene, and Miocene^{5,36}. However, it was shown that MICI is not necessarily required, and that better agreement might also be achieved with greater ocean

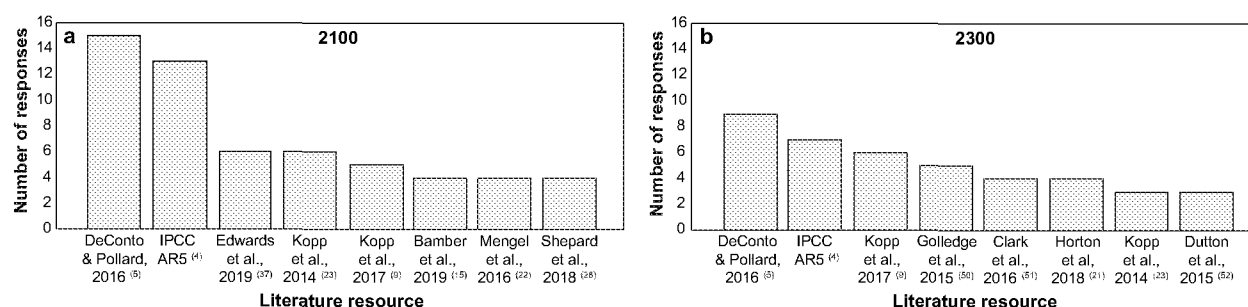


Fig. 5 Bar chart of specific resources that were most influential to the professional judgments of the expert projections of future global mean sea-level rise and its uncertainties. **a** 2100 and **b** 2300. Only the top eight literature sources that were cited are shown.

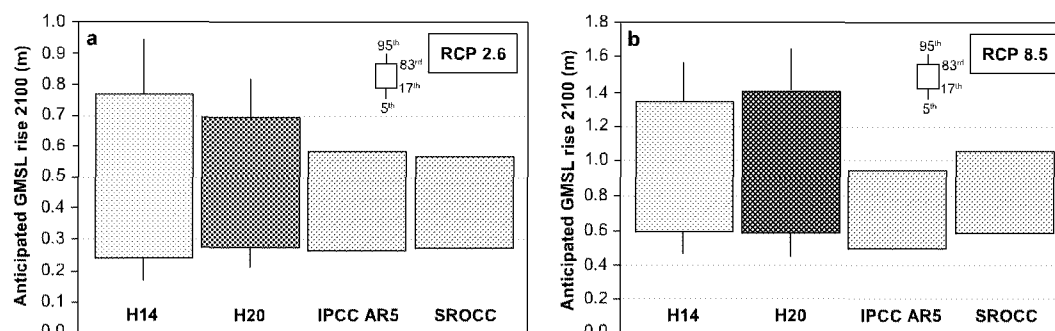


Fig. 6 Box plots of likely (17th to 83rd percentiles) and very likely (5th to 95th percentiles) sea-level rise for RCP 2.6 (blue) and RCP 8.5 (red) greenhouse gas scenarios for 2100 from projections studies: H14 and H20 surveys; IPCC AR5; and SROCC8. We have standardized projection windows for the surveys and the IPCC following ref. ¹.

warming and/or incorporation of meltwater-ocean feedbacks that increase ice loss^{37,38}. Both refs. ^{37,38} feature in the list of cited resources from experts, but due to the brief period of time between publication and the H20 survey, their impact is potentially underrepresented in our results. While the role of the IPCC is prominent in societal and policy debates, we have no clear understanding of its impact on the field of climate science itself, or on other scientific fields. Here, the AR5 was the second most cited source⁴, with 12% for 2100 and 10% in 2300.

The expert projections for 2100 and 2300 generally illustrate that substantial uncertainty still remains in projecting GMSL rise¹, with a considerable proportion of experts projecting a greater rise by 2100 than the IPCC AR5 (Fig. 6). Our survey suggests that the high upper-end estimates and uncertainties arise from the expected response of the Antarctic Ice Sheet to warming. The multimeter GMSL rise projected by some experts under RCP 8.5 would expose up to hundreds of millions of people to coastal flooding³⁹ and devastate coastal ecosystems⁴⁰. However, the expert projections also clearly illustrate the potential for evading such large GMSL rise through successful reduction of emissions.

METHODS

Choice of experts

The choice of experts is a critical element of expert surveys^{41,42}. We followed a similar approach taken for the H14 survey to identify sea-level experts. H14 chose the 500 experts who (co-)authored the most papers. H20 selected experts who (co-)authored ≥ 6 papers, the minimum number of papers published by the top 500 (co-)authors in H14. To objectively select sea-level experts, we used the scientific publication database Web of Science of Clarivate to identify the most active publishers of sea-level papers. On 15 February 2019, we searched for all papers published in peer-reviewed journals since (and including) 2014 where the term “sea level” appeared in the title, keywords or “KeyWords Plus” (an algorithm used to review words or phrases that appear in the cited references of an article) to identify scientists who (co-)authored the greatest number of these papers.

We obtained a sample of 878 experts who published at least six papers on “sea level” since 2014. We found e-mail addresses for 817 of these experts and accordingly invited them to participate in the survey on 18 March 2019, using a unique identifier to ensure anonymity and avoid duplicate responses. A total of 458 experts opened the e-mail invitation, and of these 112 completed the survey, which is typical for this type of internet survey (e.g., ref. ⁴³). The main reason given for declining to participate was a (perceived) lack of expertise in projecting GMSL rise. We closed the survey on 30 June 2019. We could not analyze six responses from participants because they either left all boxes blank or filled with a question mark. Not all survey respondents completed every percentile box.

Thus, a total of 106 sea-level experts from 817 invites (13%) provided their probabilistic assessment of GMSL rise, given two temperature scenarios derived from the upper and lower extremes of the RCP scenarios²³ (Fig. 1). This compares to 90 from 360 invites (44%) in H14. Survey nonresponse increases the risk of error⁴⁴. There is an international trend toward declining response rates in social surveys (e.g. refs. ^{34,45}) that has been attributed to difficulty in contacting individuals, and their reluctance to participate³⁶ because of the rise of online surveys, mobile phones, information requests, societal changes, and greater awareness of privacy issues³⁴.

In the RCP 2.6 scenario, there is warming of $\sim 1^\circ\text{C}$ by 2100 (relative to 1986–2005), with high probability that the global temperature stays below the 2015 Paris Agreement, which aims to limit warming to 2 or 1.5°C above preindustrial level. RCP 2.6 is equivalent to RCP 3-PD (where “PD” stands for Peak and Decline) that was used in the H14 survey. In the RCP 8.5 emission scenario, there is warming of 4.5°C by 2100. For the extended RCP 2.6 scenario, a global temperature increase of 0.0 to 1.2°C is projected for the late 23rd century (2281–2300 average) relative to 1986–2005⁴⁷. For the extended RCP 8.5, global temperature increase of 3.0 – 12.6°C is projected over the same time period⁴⁷.

Likelihood language

In recent years, there have been a number of different definitions of likelihood language, particularly as it pertains to GMSL estimates. Reference⁴⁸ defined “likely” to mean at least 66% probability, and “very likely” to mean at least 90% probability. Such definitions are consistent with certain publications that discuss GMSL projections, such as ref. ²¹,

where probabilities of future GMSL are assessed broadly across a large number of studies. However, the sea-level rise projections provided in IPCC AR5 followed a slightly different definition of likelihood language, defining “likely” to mean a central 66% probability range, and “very likely” to be a central 90% probability range³. Similarly, the recent SROCC defined “likely range” as the 17–83% probability range, and “very likely range” as the 5–95% probability range³. Our use of likelihood language follows the IPCC AR5 and SROCC definitions, consistent with refs. ^{3,8}.

Box plots and PDFs

The survey results are presented as box plots and PDFs. The PDFs provide easily interpretable summaries of the survey responses while accounting for the variability and dependencies across the individual expert projections (see Supplementary Information). For each of the future emission scenarios, we generated PDFs through Markov Chain Monte Carlo sampling from the posterior distribution for anticipated GMSL. The model for estimating the latent sea-level projection distribution, from which we draw the samples to generate the PDFs, is set up in a hierarchical framework such that the individual expert projections provide information for the latent distribution.

The hierarchical modeling approach used to estimate the GMSL PDFs has the further advantage of down-weighting outlying expert projections in the summary distribution. This is due to the smoothing effect of the model assumptions whereby the individual expert percentile estimates were assumed to come from an underlying distribution, the mean of which was assumed to come from the latent sea-level projection distribution. Note, the smoothing effect is less severe than simply summarizing the individual percentiles across experts based on calculating central summary statistics (means or medians). To illustrate the down-weighting effect seen in the PDFs, consider that, 4.8 m is the most extreme expert projection for the upper bound of the *likely range* (i.e., the 83rd percentile) by 2100 under RCP 8.5. This can be interpreted as the belief that there is a 17% chance of GMSL rise reaching or exceeding 4.8 m by 2100. However, according to the PDF for this scenario, there is a negligible chance of GMSL rising by 4.8 m by 2100. Indeed, according to the PDF, projections of GMSL rise exceeding 2.48 m by 2100 are outside of the range of what is likely under this scenario (e.g., refs. ^{49–52}).

Open-ended questions

We invited the experts to state what their greatest source of uncertainty was for their estimates for 2100 and 2300 under both RCP 2.6 and RCP 8.5 (for the exact phrasing of the questions see Supplementary Information). In addition, we invited the experts to provide specific resource(s) (e.g., academic literature, government reports, etc.) that were most influential to their responses. Responses to these questions were open-ended to elicit diverse opinions from experts without being influenced by the survey instrument. However, open-ended questions have the disadvantage (compared to close-ended questions) of having both more non-responses and a need for extensive analysis. We nonetheless decided to use open-ended questions to avoid biases in influencing our respondents' opinion about their sources of uncertainty and resources regarding sea-level rise estimates.

We placed the responses for sources of uncertainty into four main categories: (1) ice-sheet uncertainty, (2) anthropogenic uncertainty, (3) model/data limitations, and (4) ocean-atmosphere uncertainty. Ice-sheet uncertainty refers to the stability of ice sheets and ice-ocean-climate system feedbacks. Anthropogenic uncertainty refers to the uncertainties regarding the level of greenhouse gas emissions in the atmosphere as a result of permafrost thawing, fossil fuels, and potential mitigation strategies implemented by society, or the effect of land water storage from dam impoundment or groundwater withdrawal. Model/data refers to uncertainty about scientific estimations and models or data gaps needed to model these systems accurately. Ocean-atmosphere uncertainty refers to the distribution of heat as a result of ocean circulation. In many cases, experts provided more than one source of uncertainty for their sea-level rise estimates. We reported the number of times a particular source of uncertainty was provided in our open-ended questions, therefore the number of selected uncertainties can (and does) exceed the number of individual experts who responded to the survey.

For the open-ended questions about the specific resources used to support their sea-level rise estimates, most experts provided the author, year, and journal of publication, from which we were able to identify the specific reference. We reported the number of times each article was stated by our respondents. We also received responses that were generic

(e.g., articles from a specific author) or a misspelling from the expert. We did not report these cases because we could not identify the specific references to which the respondent was referring.

We received approval to conduct our survey from the NTU Institutional Review Board on 17 January 2019 (IRB-2018-10-048).

DATA AVAILABILITY

All data generated during this study are included in this published article (and its Supplementary Information). The data are also available in Nanyang Technological University (NTU) repository [<https://researchdata.ntu.edu.sg/dataset.xhtml?persistentId=doi:10.21979/N9/JBCF2Q>].

CODE AVAILABILITY

The code for producing the probability density functions (PDF) is available at <https://github.com/ncahill89/H20Survey>.

Received: 27 December 2019; Accepted: 6 April 2020;

Published online: 08 May 2020

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ACKNOWLEDGEMENTS

B.P.H., N.S.K., and T.A.S. are supported by the Singapore Ministry of Education Academic Research Fund MOE2019-T3-1-004, the National Research Foundation Singapore, and the Singapore Ministry of Education, under the Research Centers of Excellence initiative. This article is a contribution to PALSEA (Palaeo-Constraints on Sea-Level Rise), HOLSEA, and International Geoscience Program (IGCP) Project 639, “Sea-Level Changes from Minutes to Millennia”. This work is Earth Observatory of Singapore contribution 299.

AUTHOR CONTRIBUTIONS

B.P.H. designed and oversaw all aspects of the research and took the lead on writing the manuscript. N.S.K., J.S.H.L., T.A.S., A.C.K., S.E.E., and S.R. led the design of the survey and N.S.K. and T.A.S. identified the experts. N.C. constructed the probability density functions and applied a statistical model to estimate exceedance probabilities. Selected portions of the manuscript or supplement were written by all authors. All authors reviewed the manuscript.

COMPETING INTERESTS

The authors declare no competing interests.

ADDITIONAL INFORMATION

Supplementary information is available for this paper at <https://doi.org/10.1038/s41612-020-0121-5>.

Correspondence and requests for materials should be addressed to B.P.H.

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From: Roy Spencer <roywspencer@hotmail.com>
Sent: Monday, August 4, 2025 12:38 PM
To: Ross McKittrick; John Christy
Cc: Judith Curry; Steve Koonin
Subject: Re: Section 6.4 Precipitation Extremes

I've never understood the argument that fitting a trend to an established dataset needs to be peer-reviewed to be accepted by the community.

The values themselves are accepted, right? And an average of those values would be as well, I assume.

But if you fit a trend line to the data, you'd better get the consensus-approved sign right!

-Roy

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Monday, August 4, 2025 10:16 AM
To: John Christy <climateman60@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>; Steve Koonin <steven.koonin@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Josh Loucks <loucksj14@gmail.com>; Cohen, Seth <seth.cohen@hq.doe.gov>; Travis Fisher <travis.scott.fisher@gmail.com>
Subject: Re: Section 6.4 Precipitation Extremes

I'm happy to do the analysis. I'll have some time later this week. Though we'll get criticized for citing results that haven't appeared in a journal yet. I'll run all the data and see what the results are. There may be a way to summarize it briefly.

On Mon, Aug 4, 2025 at 10:33 AM John Christy <climateman60@gmail.com> wrote:
All

One of the DoE reviewers criticized the choice of only 3 regions for precipitation extremes in CWG, implying cherry-picking. These three regions were based on all the data I had at the time and addressed three areas that had been pointed out by IPCC and AR5. I've built another three regions (see map) that include the upper midwest, central plains and Texas's "Flash Flood Alley". I also have added a few more in the NE (now 36 stations instead of 27). I have a few stations (12 so far) in the intermountain West, but long-term stations are very difficult to come by in this area.

While it would add a bit to the length of the CWG report and require Ross to execute some more code, we could show that we are responding to this type of criticism (i.e. we are not cherry-picking) even though it takes a tremendous amount of effort to build a single station with uninterrupted data.

John C.



From: Steven Koonin [steven.koonin@gmail.com]
Sent: 8/4/2025 3:56:06 PM
To: 'Ross McKittrick' [ross.mckittrick@gmail.com]; 'John Christy' [climateman60@gmail.com]
CC: 'Judith Curry' [curry.judith@gmail.com]; 'Roy Spencer' [roywspencer@hotmail.com]
Subject: RE: Section 6.4 Precipitation Extremes
Attachments: image001.png

Good idea. And there's more than a month to sort this out.

SEK

PS Dropping off the non-authors, per my previous email.

From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Monday, August 4, 2025 11:17 AM
To: John Christy <climateman60@gmail.com>
Cc: Judith Curry <curry.judith@gmail.com>; Steve Koonin <steven.koonin@gmail.com>; Roy Spencer <roywspencer@hotmail.com>; Josh Loucks <loucksj14@gmail.com>; Cohen, Seth <seth.cohen@hq.doe.gov>; Travis Fisher <travis.scott.fisher@gmail.com>
Subject: Re: Section 6.4 Precipitation Extremes

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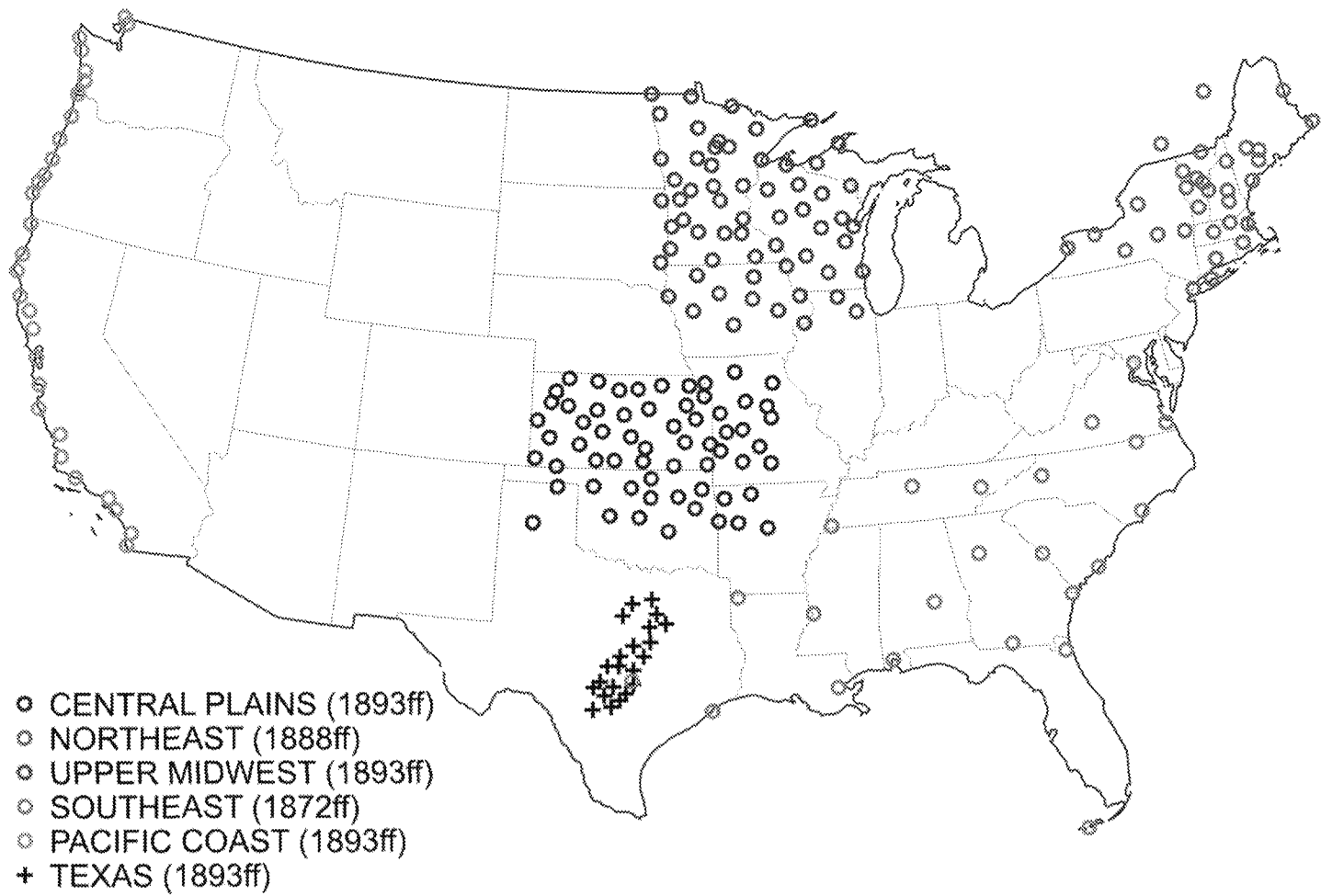
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John C.



From: Ross McKittrick <ross.mckittrick@gmail.com>
Sent: Monday, August 4, 2025 11:17 AM
To: John Christy
Cc: Judith Curry; Steve Koonin; Roy Spencer; Josh Loucks; Cohen, Seth; Travis Fisher
Subject: Re: Section 6.4 Precipitation Extremes
Attachments: US48_Map_Updated_1(7_28_25).png

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John C.



From: Judith Curry [curry.judith@gmail.com]
Sent: 8/4/2025 3:11:22 PM
To: John Christy [climateman60@gmail.com]
CC: Ross McKittrick [ross.mckittrick@gmail.com]; Steve Koonin [steven.koonin@gmail.com]; Roy Spencer [roywspencer@hotmail.com]; Josh Loucks [loucksj14@gmail.com]; Cohen, Seth [seth.cohen@hq.doe.gov]; Travis Fisher [travis.scott.fisher@gmail.com]
Subject: Re: Section 6.4 Precipitation Extremes

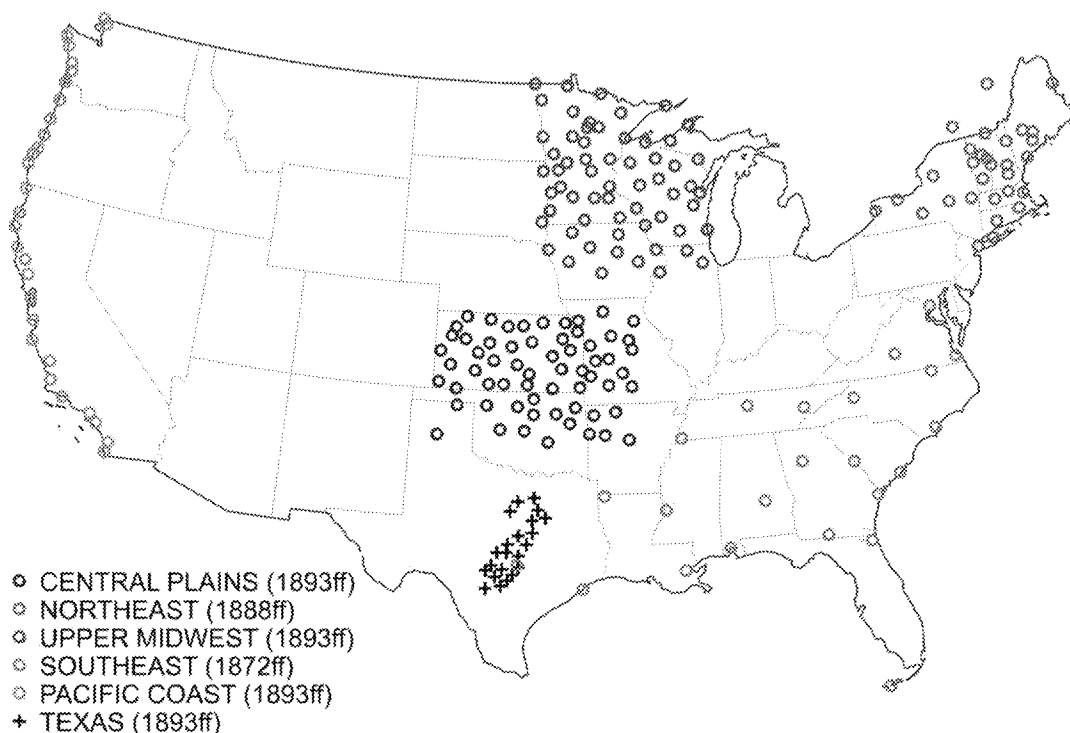
We can argue that we aren't cherry picking, merely selecting stations with the longest and most robust data records

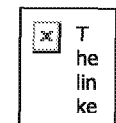
On Mon, Aug 4, 2025 at 7:33 AM John Christy <climateman60@gmail.com> wrote:
All

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John C.





Judith Curry, President
CFAN - Climate Forecast Applications Network
Reno, NV USA
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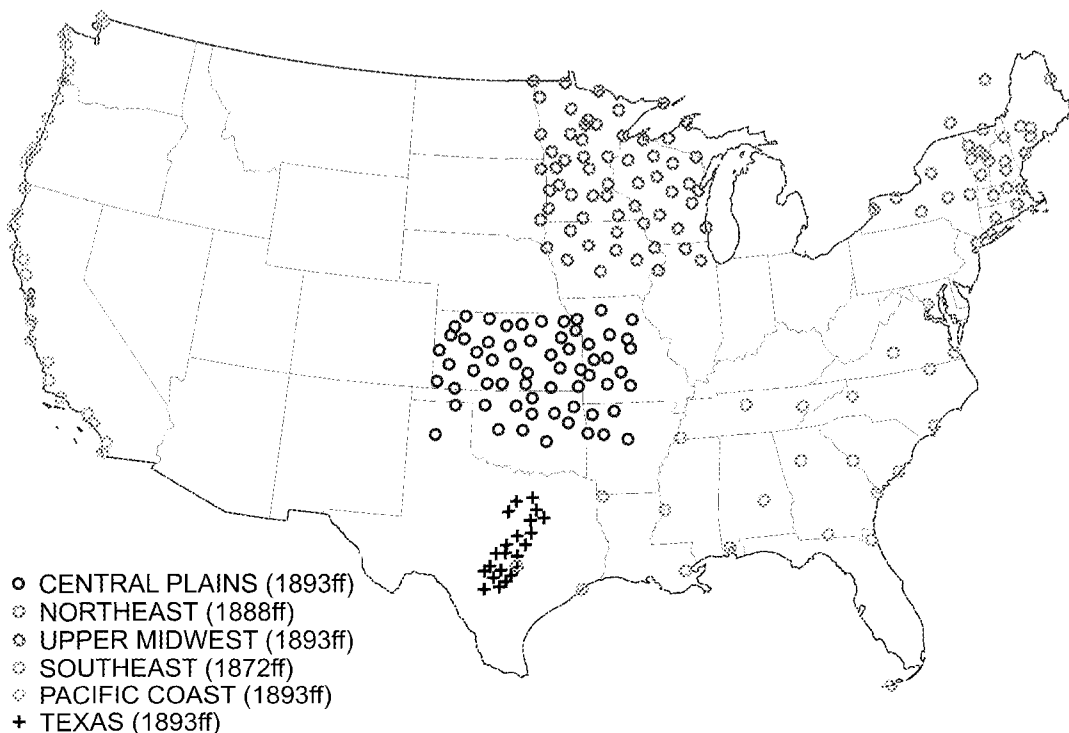
From: John Christy <climateman60@gmail.com>
Sent: Monday, August 4, 2025 10:33 AM
To: Ross McKittrick
Cc: Judith Curry; Steve Koonin; Roy Spencer; Josh Loucks; Cohen, Seth; Travis Fisher
Subject: Section 6.4 Precipitation Extremes

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John C.



From: John Christy [climateman60@gmail.com]
Sent: 8/19/2025 3:24:43 PM
To: Roy Spencer [roywspencer@hotmail.com]
CC: Steven Koonin [steven.koonin@gmail.com]; Ross McKittrick [ross.mckittrick@gmail.com]; Judith Curry [curry.judith@gmail.com]
Subject: Re: corn belt temperature trends?

Roy

I'll check, but about half of the total USHCN stations have closed since 2000, so that means about half of the dataset is simply interpolations from the other stations - which are usually in more populated areas that were able to maintain the record.

John C.

On Tue, Aug 19, 2025 at 9:38 AM Roy Spencer <roywspencer@hotmail.com> wrote:
Yes.

From: John Christy <climateman60@gmail.com>
Sent: Tuesday, August 19, 2025 8:41 AM
To: Steven Koonin <steven.koonin@gmail.com>
Cc: Roy Spencer <roywspencer@hotmail.com>; Ross McKittrick <ross.mckittrick@gmail.com>; Judith Curry <curry.judith@gmail.com>
Subject: Re: corn belt temperature trends?

Roy

So these are from the adjusted (52j) station datasets with interpolated values for stations that have closed?
<https://www.ncei.noaa.gov/pub/data/ushcn/v2.5/>

California probably has a lot of UHI going on in those 50 years.

John C.

On Tue, Aug 19, 2025 at 7:42 AM Steven Koonin <steven.koonin@gmail.com> wrote:

Thanks, Roy. I think it's important to dig into this as it's one of the more surprising (and telling) graphs we present.

SEK

From: Roy Spencer <roywspencer@hotmail.com>
Sent: Tuesday, August 19, 2025 6:53 AM
To: Steven Koonin <steven.koonin@gmail.com>
Cc: Ross McKittrick <ross.mckittrick@gmail.com>; Judith Curry <curry.judith@gmail.com>; John Christy <climateman60@gmail.com>
Subject: Re: corn belt temperature trends?

I computed the July homogenized Tmax temperate trends at all 1,218 USHCN stations for 1973-2025, directly from the monthly average temperatures in the NOAA USHCN data files.

These are supposedly the highest quality stations in the U.S. (most are co-op stations, a few come from small airports).

Here are the Tmax trends for the IOWA stations, ranked from high to low.

These are pretty amazing, considering the U.S. area-average July temperature trend for 1973-2025 is +0.20 deg. C/decade... also amazing is how much variation in station trends there is within a state. I would not expect 53-year "global warming" temperature trends to vary nearly this much across a state, unless there are localized effects such as the cool ocean keeping San Diego or L.A. From warming very much.

0.00	IA	STORM LAKE 2 E
-0.01	IA	ESTHERVILLE 2 N
-0.06	IA	MT PLEASANT 1 SSW
-0.11	IA	BELLE PLAINE
-0.13	IA	NEW HAMPTON
-0.14	IA	INDIANOLA 2W
-0.15	IA	MT AYR
-0.18	IA	ALGONA 3 W
-0.19	IA	FAYETTE
-0.21	IA	TOLEDO 3N
-0.21	IA	WASHINGTON
-0.22	IA	ROCK RAPIDS
-0.23	IA	FOREST CITY 2 NNE
-0.25	IA	FAIRFIELD
-0.25	IA	LE MARS
-0.27	IA	CHARLES CITY
-0.28	IA	CLINTON #1
-0.28	IA	ROCKWELL CITY
-0.34	IA	IOWA FALLS
-0.35	IA	ALBIA 3 NNE
-0.35	IA	LOGAN
-0.37	IA	FORT DODGE 5NNW
-0.43	IA	CLARINDA

Here are the ILLINOIS station Tmax trends for July:

trend=	0.14	IL	CHARLESTON
trend=	0.09	IL	PANA 3E
trend=	0.06	IL	MT CARROLL
trend=	0.02	IL	PERRY 6 NW
trend=	-0.03	IL	DIXON 1 NW
trend=	-0.04	IL	MORRISON
trend=	-0.05	IL	HILLSBORO
trend=	-0.05	IL	JACKSONVILLE 2E
trend=	-0.05	IL	URBANA
trend=	-0.07	IL	MCLEANSBORO
trend=	-0.07	IL	MONMOUTH
trend=	-0.08	IL	AURORA
trend=	-0.10	IL	PALESTINE
trend=	-0.11	IL	CARLINVILLE
trend=	-0.11	IL	PARIS WTR WKS
trend=	-0.12	IL	MARENGO
trend=	-0.12	IL	SPARTA 1 W
trend=	-0.14	IL	GALVA
trend=	-0.14	IL	OLNEY 2S
trend=	-0.15	IL	WINDSOR
trend=	-0.16	IL	ANNA 2 NNE
trend=	-0.16	IL	DU QUOIN 4 SE
trend=	-0.16	IL	WHITE HALL 1 E
trend=	-0.17	IL	PONTIAC
trend=	-0.18	IL	HARRISBURG
trend=	-0.18	IL	HOOPESTON 1 NE
trend=	-0.18	IL	MINONK
trend=	-0.21	IL	ALEDO
trend=	-0.21	IL	DANVILLE
trend=	-0.22	IL	LA HARPE
trend=	-0.22	IL	LINCOLN
trend=	-0.23	IL	DECATUR WTP
trend=	-0.23	IL	OTTAWA 5SW
trend=	-0.24	IL	WALNUT
trend=	-0.31	IL	RUSHVILLE
trend=	-0.33	IL	MT VERNON 3 NE

...and here are the INDIANA Tmax trends for July:

trend=	0.18	IN	WINAMAC 2SSE
trend=	0.12	IN	SEYMOUR 2 N
trend=	0.05	IN	CHARLESTOWN 5 NNW
trend=	0.05	IN	MADISON SEWAGE PLT
trend=	0.05	IN	VEVAY
trend=	0.01	IN	ANDERSON SEWAGE PI
trend=	0.01	IN	ANGOLA
trend=	0.01	IN	RUSHVILLE
trend=	0.00	IN	ROCHESTER
trend=	-0.02	IN	BROOKVILLE
trend=	-0.02	IN	PAOLI
trend=	-0.02	IN	ROCKVILLE
trend=	-0.03	IN	GOSHEN 3SW
trend=	-0.04	IN	WHEATFIELD
trend=	-0.05	IN	SHOALS 8 S
trend=	-0.06	IN	WHITESTOWN
trend=	-0.07	IN	CAMBRIDGE CITY 3 N
trend=	-0.07	IN	VINCENNES 5 NE
trend=	-0.08	IN	PRINCETON 1 W
trend=	-0.09	IN	BLOOMINGTON IN UNI
trend=	-0.09	IN	MARION 2 N
trend=	-0.09	IN	SCOTTSBURG
trend=	-0.10	IN	BERNE WWTP
trend=	-0.10	IN	DELPHI 2 N
trend=	-0.10	IN	SALEM
trend=	-0.11	IN	GREENFIELD
trend=	-0.11	IN	HUNTINGTON
trend=	-0.11	IN	RENSSELAER
trend=	-0.12	IN	HOBART 2 WNW
trend=	-0.13	IN	MT VERNON
trend=	-0.13	IN	WASHINGTON 1 W
trend=	-0.14	IN	LAPORTE
trend=	-0.15	IN	OOLITIC PURDUE EX FR
trend=	-0.22	IN	COLUMBUS
trend=	-0.24	IN	CRAWFORDSVILLE 6 SE
trend=	-0.31	IN	GREENCASTLE 1 W

Hopefully by the end of this week I'll have statistics on how these trends correlate with trends in Landsat -based Impervious Surface coverage at different spatial resolutions (30m up to 10 km).

I've included the spreadsheet including all 48 CONUS states for anyone who wants to play with the data.

-Roy

From: Steven Koonin <steven.koonin@gmail.com>
Sent: Monday, August 18, 2025 3:15 PM
To: Roy Spencer <roywspencer@hotmail.com>
Cc: Ross McKittrick <ross.mckittrick@gmail.com>; Judith Curry <curry.judith@gmail.com>; John Christy <climateman60@gmail.com>
Subject: Re: corn belt temperature trends?

Interesting. So is it the increasing agricultural production or the irrigation that's keeping the region cool? And are there similar mismatches in other "breadbasket" regions (Ukraine? Kashmir? ???)

And do let us know about the area weighting when you can.

If the corn belt mismatch is anomalous within CONUS, we should say something about that in the report.

SEK

On Aug 18, 2025, at 15:40, Roy Spencer <roywspencer@hotmail.com> wrote:

The Corn Belt temperatures come from "official" data: the state-wide monthly average of daily Tmax and Tmin, calculated by NOAA with homogenization adjustments and high-resolution interpolation using many stations in the new nClimDiv (NOAA Climate Division) dataset publicly available at <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series>. The 12 Corn Belt states are then just averaged together (as I recall, I'll need to check to see if I weighted the states by their areas). Linear trends were calculated in Excel from each calendar month separately (as I recall... I need to check my spreadsheets at work).

The model data are come from the KNMI Climate Explorer website, using one member per model, and area-average temperatures computed by KNMI with user-input of latitude and longitude bounds that approximated the Corn Belt Region. It is considerably more difficult to compute these averages from the model grid point data, the files for which seem to have been made very difficult to read by Lawrence Livermore. The results will not change hardly at all because trends from the models over several decades will be spatially uniform.

NOTE.... recently I've been looking at dewpoint trends in the Corn Belt in the summer at airports for all 24 hours throughout the day... these are very significantly upward. So, if one computed the heat index (or more scientifically, the moist enthalpy) it could well be there would be better agreement between observations and models.

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Attachments: Chart2-CMIP6-SSP245-37N-49N-256E-279E-Tas-Corn-Belt.xlsx; Corn-Belt-sfc-temps-NOAA-vs-CMIP6.xlsx

Here's the Corn Belt surface temperature file I think I used... I just did a 12-state average of the June/July/August data.

Also the CMIP 6 file, has the latitude longitude bounds in the filename.

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trend=	-0.22	IL	LA HARPE
trend=	-0.22	IL	LINCOLN
trend=	-0.23	IL	DECATUR WTP
trend=	-0.23	IL	OTTAWA 5SW
trend=	-0.24	IL	WALNUT
trend=	-0.31	IL	RUSHVILLE
trend=	-0.33	IL	MT VERNON 3 NE

...and here are the **INDIANA** Tmax trends for July:

trend=	0.18	IN	WINAMAC 2SSE
trend=	0.12	IN	SEYMOUR 2 N
trend=	0.05	IN	CHARLESTOWN 5 NNW
trend=	0.05	IN	MADISON SEWAGE PLT
trend=	0.05	IN	VEVAY
trend=	0.01	IN	ANDERSON SEWAGE PI
trend=	0.01	IN	ANGOLA
trend=	0.01	IN	RUSHVILLE
trend=	0.00	IN	ROCHESTER
trend=	-0.02	IN	BROOKVILLE
trend=	-0.02	IN	PAOLI
trend=	-0.02	IN	ROCKVILLE
trend=	-0.03	IN	GOSHEN 3SW
trend=	-0.04	IN	WHEATFIELD
trend=	-0.05	IN	SHOALS 8 S
trend=	-0.06	IN	WHITESTOWN
trend=	-0.07	IN	CAMBRIDGE CITY 3 N
trend=	-0.07	IN	VINCENNES 5 NE
trend=	-0.08	IN	PRINCETON 1 W
trend=	-0.09	IN	BLOOMINGTON IN UNI
trend=	-0.09	IN	MARION 2 N
trend=	-0.09	IN	SCOTTSBURG
trend=	-0.10	IN	BERNE WWTP
trend=	-0.10	IN	DELPHI 2 N
trend=	-0.10	IN	SALEM
trend=	-0.11	IN	GREENFIELD
trend=	-0.11	IN	HUNTINGTON
trend=	-0.11	IN	RENSSELAER
trend=	-0.12	IN	HOBART 2 WNW
trend=	-0.13	IN	MT VERNON
trend=	-0.13	IN	WASHINGTON 1 W
trend=	-0.14	IN	LAPORTE
trend=	-0.15	IN	OOLITIC PURDUE EX FR
trend=	-0.22	IN	COLUMBUS
trend=	-0.24	IN	CRAWFORDSVILLE 6 SE
trend=	-0.31	IN	GREENCASTLE 1 W

Hopefully by the end of this week I'll have statistics on how these trends correlate with trends in Landsat-based Impervious Surface coverage at different spatial resolutions (30 m up to 10 km).

I've included the spreadsheet including all 48 CONUS states for anyone who wants to play with the data.

-Roy

From: Steven Koonin <steven.koonin@gmail.com>
Sent: Monday, August 18, 2025 3:15 PM

To: Roy Spencer <roywspencer@hotmail.com>

Cc: Ross McKittrick <ross.mckittrick@gmail.com>; Judith Curry <curry.judith@gmail.com>; John Christy <climateman60@gmail.com>

Subject: Re: corn belt temperature trends?

Interesting. So is it the increasing agricultural production or the irrigation that's keeping the region cool? And are there similar mismatches in other "breadbasket " regions (Ukraine? Kashmir? ???)

And do let us know about the area weighting when you can.

If the corn belt mismatch is anomalous within CONUS, we should say something about that in the report.

SEK

On Aug 18, 2025, at 15:40, Roy Spencer <roywspencer@hotmail.com> wrote:

The Corn Belt temperatures come from "official" data: the state-wide monthly average of daily Tmax and Tmin, calculated by NOAA with homogenization adjustments and high-resolution interpolation using many stations in the new nClimDiv (NOAA Climate Division) dataset publicly available at <https://www.ncei.noaa.gov/access/monitoring/climate-at-a-glance/statewide/time-series>. The 12 Corn Belt states are then just averaged together (as I recall, I'll need to check to see if I weighted the states by their areas). Linear trends were calculated in Excel from each calendar month separately (as I recall... I need to check my spreadsheets at work).

The model data are come from the KNMI Climate Explorer website, using one member per model, and area-average temperatures computed by KNMI with user-input of latitude and longitude bounds that approximated the Corn Belt Region. It is considerably more difficult to compute these averages from the model grid point data, the files for which seem to have been made very difficult to read by Lawrence Livermore. The results will not change hardly at all because trends from the models over several decades will be spatially uniform.

NOTE.... recently I've been looking at dewpoint trends in the Corn Belt in the summer at airports for all 24 hours throughout the day... these are very significantly upward. So, if one computed the heat index (or more scientifically, the moist enthalpy) it could well be there would be better agreement between observations and models.

In other words, the models are putting the energy imbalance into temperature rise, whereas in the real world, increasing corn and soybean yields are putting more energy into vegetation growth and evapotranspiration. This would be an interesting project for someone.

-Roy

From: Steven Koonin <steven.koonin@gmail.com>

Sent: Monday, August 18, 2025 1:35 PM

To: 'Roy Spencer' <roywspencer@hotmail.com>

Cc: 'Ross McKittrick' <ross.mckittrick@gmail.com>; 'Judith Curry' <curry.judith@gmail.com>;
'John Christy' <climateman60@gmail.com>

Subject: corn belt temperature trends?

Roy:

Many people have commented to me about how striking Figure 5.9 is. Yet, as one of the Carbon Brief critics notes, CWG25 doesn't give much detail about how the trends displayed were calculated. So can you say a bit more about the methodology: Which models and observations were used? How were trends calculated? Uncertainty estimates? Etc.

Apologies if such information was already contained in a prior email, but I've not been able to find one in my archives.

SEK

Monthly Anomalies		0	1	2	3	4	5	6
		ACCESS-CM2	ACCESS-ES	AWI-CM-1	BCC-CSM2	CAMS-CSM	CanESM5-(	CanESM5/i
		r1i1p1f1						
1850	1	2.09125	-1.44388	-0.33337	-3.51254	-2.29495	-1.70963	-1.70963
1850	2	-0.19574	-1.53687	0.720367	1.45929	-0.9101	-0.41608	-0.41608
1850	3	0.16156	0.151489	1.29507	-1.97427	0.273224	-0.23584	-0.23584
1850	4	-2.79398	-1.1138	-1.78168	1.81622	0.247559	0.548431	0.548431
1850	5	0.216614	-0.50858	-1.16263	0.649536	-3.12689	-1.12439	-1.12439
1850	6	-0.749634	3.608	-1.52975	-3.79114	-1.33481	0.363342	0.363342
1850	7	-1.19635	1.49643	-2.12973	-4.76553	-1.0813	-1.5961	-1.5961
1850	8	-1.08548	3.77478	-2.82016	-1.69171	0.198486	-1.23444	-1.23444
1850	9	0.155121	-1.42667	-3.24677	-3.3486	1.33728	-1.60992	-1.60992
1850	10	1.56241	0.785736	1.38531	-4.13373	-3.44034	-2.48395	-2.48395
1850	11	-9.12E-03	1.29984	2.6517	-0.8204	-1.89E-02	0.536865	0.536865
1850	12	0.704987	3.3985	-2.03156	-1.61484	2.39465	3.93591	3.93591
1851	1	3.16644	-0.8851	-3.15417	-4.65756	2.28644	-2.81201	-2.81201
1851	2	1.85187	-6.28415	0.676392	2.5874	3.15509	-0.15808	-0.15808
1851	3	0.86084	-1.29761	2.74435	3.80124	1.4805	1.55084	1.55084
1851	4	0.590424	-0.23019	-2.4169	-2.09286	-1.42755	1.05283	1.05283
1851	5	2.76541	-1.41168	-1.03763	-2.14026	-0.13187	1.25671	1.25671
1851	6	-0.921814	-0.57629	-1.04166	-0.29865	0.64209	-1.23148	-1.23148
1851	7	-1.59915	1.69241	-2.48004	-1.27261	1.31229	5.27E-02	5.27E-02
1851	8	0.28421	0.965179	-3.31644	0.909576	2.51218	1.48846	1.48846
1851	9	-0.292084	-1.59616	-2.26736	1.9639	0.341187	-0.68112	-0.68112
1851	10	2.32028	-1.33255	0.761292	-4.2012	-1.88034	0.186035	0.186035
1851	11	0.65976	-4.47906	-0.81781	-1.2688	-0.91077	-1.46542	-1.46542
1851	12	4.15228	-6.6528	1.70895	-0.16101	-0.57126	2.255	2.255
1852	1	0.956421	0.997498	-0.20767	0.196655	-1.15158	0.744202	0.744202
1852	2	3.86856	0.698151	0.910492	0.756897	0.394012	5.63141	5.63141
1852	3	3.82974	-1.4884	3.40417	-1.75717	-3.88107	1.52994	1.52994
1852	4	2.4649	-0.2345	3.30911	-2.33176	-1.64523	2.32663	2.32663
1852	5	1.64832	-1.9585	-2.32123	0.41983	-3.31339	-0.1424	-0.1424
1852	6	2.07318	-1.20438	-1.21725	-1.15326	-3.14059	1.06604	1.06604
1852	7	-0.545654	-0.99008	-1.99503	-1.91434	-0.97272	-0.87952	-0.87952
1852	8	3.72742	4.47E-02	-3.55484	0.671997	-0.37051	-2.25385	-2.25385
1852	9	3.98E-01	0.144257	0.542542	-1.48071	8.48E-03	2.28049	2.28049
1852	10	-2.121	2.32596	-1.35458	1.0051	-1.37692	-4.34586	-4.34586
1852	11	-0.805542	-0.89697	0.802002	2.26898	-2.36276	-0.35382	-0.35382
1852	12	2.38278	-1.36108	-1.57086	0.33548	1.05276	-1.9762	-1.9762
1853	1	2.65344	-2.526	0.174347	-4.78775	-1.99747	1.28259	1.28259
1853	2	0.596588	0.895447	1.66428	-1.02771	-4.09061	3.26E-02	3.26E-02
1853	3	-7.47E-02	1.41519	1.86246	-3.49527	-1.58859	-1.39706	-1.39706
1853	4	1.54E+00	2.16461	-6.31839	3.00885	9.52E-02	0.245453	0.245453

1853	5	1.1113	-1.06E-02	-2.85593	-1.21878	-0.53198	-1.39E-02	-1.39E-02
1853	6	-0.130737	-1.49728	-0.70566	-0.51154	-2.03918	-1.70505	-1.70505
1853	7	-1.29056	-0.63678	0.332977	-0.24661	-4.37512	-2.43182	-2.43182
1853	8	-3.88528	-1.72552	-1.80167	1.9798	-1.58054	-2.64365	-2.64365
1853	9	-2.23737	-3.96317	-4.55496	-0.33679	-1.34802	-1.81802	-1.81802
1853	10	2.3707	-0.27805	0.324005	-5.06082	0.335663	0.783936	0.783936
1853	11	-2.03494	1.07224	2.24429	0.223572	1.38434	-1.28372	-1.28372
1853	12	2.79956	1.05322	-1.62854	-0.21133	3.47986	-1.96899	-1.96899
1854	1	1.60724	0.999023	1.16125	-0.13696	-3.77255	3.18909	3.18909
1854	2	1.71027	3.05765	0.481476	-0.34271	2.9657	0.191101	0.191101
1854	3	1.80484	0.851196	-2.31464	0.226532	0.168518	-0.93207	-0.93207
1854	4	-0.113098	0.478027	-2.7663	-3.58E-02	0.81604	1.26382	1.26382
1854	5	0.775604	1.5365	-3.38904	3.50992	-2.78506	-1.9903	-1.9903
1854	6	-6.50E-01	2.39462	0.216339	0.434448	2.01E-02	-1.83817	-1.83817
1854	7	-0.605743	-2.20877	-1.96442	2.65E-02	0.212097	-2.04202	-2.04202
1854	8	0.708008	0.748779	-2.64575	-0.15881	-1.00153	-1.41922	-1.41922
1854	9	1.41443	3.47385	-2.73386	-2.07471	-0.27182	-2.57434	-2.57434
1854	10	-0.333191	4.24786	-2.77359	0.893799	-1.47345	-4.93207	-4.93207
1854	11	-2.02054	1.80124	0.779907	-5.09003	1.10324	0.59256	0.59256
1854	12	-0.825439	-0.8728	-4.74677	1.63947	-1.96634	-2.27087	-2.27087
1855	1	-0.631073	-2.3544	-2.40936	2.33694	1.21503	-0.7309	-0.7309
1855	2	-2.19653	-0.21857	1.34927	-0.57712	-2.63141	4.6734	4.6734
1855	3	-1.01E+00	1.77469	-2.16745	2.32333	2.15E-02	-1.55325	-1.55325
1855	4	1.99139	0.121429	-1.71948	0.715729	1.53134	0.451843	0.451843
1855	5	2.01941	9.04E-02	-0.27283	2.15234	-1.62619	-1.91058	-1.91058
1855	6	-3.06241	0.681122	-2.15527	-0.57925	-0.9375	-2.05878	-2.05878
1855	7	0.117645	2.4877	-2.50174	1.34259	-1.60492	-1.73849	-1.73849
1855	8	1.75372	4.36948	-2.86954	1.42987	-3.29391	-2.92725	-2.92725
1855	9	1.96E+00	-0.51816	-2.66705	-0.54279	2.69E-03	-3.12753	-3.12753
1855	10	-2.79572	-1.09314	1.3179	-5.21472	-0.51074	-2.90967	-2.90967
1855	11	-2.27893	-0.14545	-0.17539	0.442474	1.96823	-0.26914	-0.26914
1855	12	-0.178528	-2.69028	0.377136	1.26328	-2.62625	4.4971	4.4971
1856	1	2.52484	2.18311	-1.69565	-0.84445	0.809723	1.99509	1.99509
1856	2	1.01236	0.363647	1.31198	3.88638	1.68869	2.46591	2.46591
1856	3	0.113556	2.73969	1.05807	2.09503	-0.71079	0.309631	0.309631
1856	4	1.59332	8.80E-02	-1.42908	2.29575	-0.25833	-0.59348	-0.59348
1856	5	0.469299	0.775604	-2.38974	-1.83676	-0.81937	-1.44128	-1.44128
1856	6	0.195374	0.274597	0.107117	-5.02963	-1.23779	-1.73175	-1.73175
1856	7	1.31274	0.937103	-2.26654	-2.41272	-0.10172	-3.9093	-3.9093
1856	8	0.972137	-0.47421	-2.49905	1.1709	1.20236	-0.78284	-0.78284
1856	9	0.532928	-5.49225	-0.55246	9.46E-02	0.922882	-1.17993	-1.17993
1856	10	-1.4035	-2.19556	-2.0351	1.6167	1.10117	-3.35706	-3.35706
1856	11	4.06238	-2.00076	1.49609	-0.92081	-2.51587	0.197357	0.197357
1856	12	1.70328	-0.60199	-0.48087	0.924774	-2.00266	2.05902	2.05902
1857	1	3.50912	0.893311	-3.17197	1.14264	-4.03735	-0.93222	-0.93222
1857	2	3.85147	3.59824	3.20227	-4.33591	1.1524	1.03281	1.03281
1857	3	1.62E-02	1.95837	6.61465	-0.85297	2.5531	-0.54947	-0.54947

1857	4	-0.333191	-2.04639	3.60831	2.96344	-0.87174	-0.14298	-0.14298
1857	5	-0.981781	-1.1203	-3.11725	-0.43796	0.933319	-0.34619	-0.34619
1857	6	-1.61972	0.157013	-0.33817	-0.30594	-1.5896	-2.14465	-2.14465
1857	7	0.181946	-0.2269	-1.45984	1.78958	-0.63272	-2.76962	-2.76962
1857	8	-1.87E-02	1.06808	-0.67105	1.1868	-4.16861	-3.72943	-3.72943
1857	9	-2.53839	-2.38037	-1.31094	0.491608	1.04239	-0.74832	-0.74832
1857	10	-2.4584	-2.39645	-0.9725	-2.45273	0.495178	0.987244	0.987244
1857	11	-1.01303	0.432343	-1.00308	-0.74091	0.978638	-1.46265	-1.46265
1857	12	2.47888	-2.40689	-2.72275	1.14648	-1.94025	-1.16528	-1.16528
1858	1	1.98172	1.44592	-1.00806	-1.83847	-1.68866	1.21848	1.21848
1858	2	-0.934021	-1.98328	1.97388	3.29718	2.10431	3.96951	3.96951
1858	3	-2.04544	-2.91013	2.50146	2.41275	-1.94067	4.05563	4.05563
1858	4	2.3429	-1.75858	-0.25739	-0.93607	-0.24234	-0.99716	-0.99716
1858	5	-0.4151	-1.763	-0.85284	-0.15476	-1.57437	-2.33679	-2.33679
1858	6	-0.492737	-0.73828	-2.36868	-4.75876	-1.4418	-0.49966	-0.49966
1858	7	-4.86E-02	-2.9881	-2.52625	-2.37701	-1.70761	-2.19531	-2.19531
1858	8	-1.95E+00	1.4527	-4.08844	-1.2196	8.79E-02	-0.77234	-0.77234
1858	9	-3.59698	-2.34955	-1.93414	-2.31699	-0.4631	-2.42053	-2.42053
1858	10	-0.971008	-2.06046	-1.0849	3.13278	-2.18713	-2.05316	-2.05316
1858	11	-0.551331	-0.28137	-3.3797	1.75848	1.06372	-3.17874	-3.17874
1858	12	-0.324829	7.63E-02	-1.60724	5.07318	-1.30225	1.34961	1.34961
1859	1	-1.06696	-0.88959	3.27115	3.46564	-0.37787	-1.72812	-1.72812
1859	2	-3.78E+00	-0.39685	0.283081	3.5011	3.42E-02	0.263824	0.263824
1859	3	-1.35846	1.5318	-1.55923	-0.88577	-2.20709	3.42786	3.42786
1859	4	1.80E-03	-0.7294	4.54E-02	0.903625	-1.20456	-1.70657	-1.70657
1859	5	-0.418182	-3.65128	-2.53473	-1.98926	-3.44778	0.227997	0.227997
1859	6	0.800171	-0.53989	-1.04367	-1.36624	-0.21249	-1.31946	-1.31946
1859	7	-1.14404	2.3056	-1.37744	-2.61292	-1.99481	-2.75891	-2.75891
1859	8	-0.476074	1.89297	-1.97824	0.55127	-2.44952	-1.36523	-1.36523
1859	9	-5.52979	-0.55426	-2.66135	-5.49E-02	2.6922	-2.13672	-2.13672
1859	10	-2.76581	-4.58896	-3.6087	3.14099	-2.34293	-1.93E-02	-1.93E-02
1859	11	0.564972	-0.15637	1.85089	1.23499	-2.55865	-1.25165	-1.25165
1859	12	2.87479	1.3428	-3.52466	1.32227	1.51767	0.908417	0.908417
1860	1	-1.38846	0.525909	2.42273	0.240631	2.19354	-0.1127	-0.1127
1860	2	3.12738	0.990723	1.88397	-3.62122	0.590393	1.34741	1.34741
1860	3	4.26004	1.0177	6.45438	-4.11365	0.878204	0.526154	0.526154
1860	4	1.36612	-2.4697	1.13312	-1.97745	-0.68036	0.147736	0.147736
1860	5	2.25662	1.41251	-2.68823	2.65173	-1.06949	1.3064	1.3064
1860	6	-0.195435	-1.2294	0.221527	1.44727	-0.24289	-0.92706	-0.92706
1860	7	-1.72E+00	-1.0647	6.29E-02	-6.13E-03	-2.90E-02	-1.16272	-1.16272
1860	8	2.22293	0.6492	-2.27966	-1.33212	-0.25934	-2.38443	-2.38443
1860	9	-3.45428	-1.48575	-2.31177	-4.29449	-1.53012	-4.25763	-4.25763
1860	10	-2.4541	-6.76846	0.291687	-0.5661	-0.85944	-2.34985	-2.34985
1860	11	0.879272	-0.52487	-1.05728	2.0748	0.612732	1.50067	1.50067
1860	12	-0.643616	-0.20599	-1.26755	2.36456	1.96375	-3.13208	-3.13208
1861	1	-1.69577	-0.67438	-0.91718	-7.37686	2.09714	2.86478	2.86478
1861	2	0.154175	2.37485	-3.21411	0.285706	1.2616	3.5473	3.5473

1861	3	0.922638	1.51068	3.43E-02	0.62384	-1.4249	-1.16797	-1.16797
1861	4	1.36481	-0.23257	0.696014	-4.76877	-0.88486	0.615326	0.615326
1861	5	-1.043	0.698608	-1.63443	0.27832	-0.69418	2.86E-02	2.86E-02
1861	6	0.957275	-1.5744	-1.69388	1.08975	-2.1178	-0.77756	-0.77756
1861	7	-1.99887	-2.95258	-1.01923	-2.53113	-0.47733	-0.55331	-0.55331
1861	8	-1.93E+00	-2.09442	-3.98816	-0.91193	-1.66E-02	-4.58273	-4.58273
1861	9	-1.57379	-3.98785	-3.63025	0.421692	-1.18152	-1.12521	-1.12521
1861	10	-0.799011	-0.60684	1.01529	2.55109	-2.56512	-1.27997	-1.27997
1861	11	0.324982	-0.42206	0.340912	-1.29163	1.00192	0.834351	0.834351
1861	12	0.366577	0.313599	1.39926	-4.47461	-2.01215	1.67172	1.67172
1862	1	1.45663	-2.129	-5.55945	0.603638	-1.42416	1.229	1.229
1862	2	-2.80801	-2.36008	-5.1701	2.96249	3.42361	-1.84088	-1.84088
1862	3	-5.55E-02	-1.9563	1.80356	1.01233	-2.25488	-4.17545	-4.17545
1862	4	1.32611	1.42853	4.44592	2.23914	-0.23364	-5.06705	-5.06705
1862	5	-0.92868	-2.1261	-1.02933	0.265045	1.10873	-1.67041	-1.67041
1862	6	0.765686	-2.16809	0.980042	2.23987	0.738098	-2.60696	-2.60696
1862	7	0.113556	0.71521	3.92227	-2.16562	-1.22	-0.63702	-0.63702
1862	8	-1.74438	3.85959	-0.41455	-1.13791	-2.35162	-0.22434	-0.22434
1862	9	-1.02008	-0.60785	-0.14127	3.2713	-3.1651	0.168884	0.168884
1862	10	-0.658691	1.88046	4.65689	0.695099	-0.36133	0.113434	0.113434
1862	11	0.924683	0.895844	-1.02341	1.20499	1.31293	-0.96323	-0.96323
1862	12	3.88406	-8.58E-02	0.551544	-1.84482	-0.93295	3.9689	3.9689
1863	1	2.29633	-3.54898	1.38333	-3.43497	-8.60498	-0.1174	-0.1174
1863	2	0.589478	-0.28998	1.50797	-5.81332	-2.7825	0.625305	0.625305
1863	3	-0.665039	-1.8627	1.85648	-0.38947	0.151428	-4.90756	-4.90756
1863	4	1.332	-3.77448	0.758698	3.30154	-1.73575	0.371124	0.371124
1863	5	-1.6842	-3.46249	-1.18134	1.64102	-1.19186	-8.71E-02	-8.71E-02
1863	6	-9.43E-01	-2.9158	-1.34818	-3.24014	3.55E-02	-2.82596	-2.82596
1863	7	-2.29477	-1.6951	-0.79633	3.78729	-3.40793	-0.18951	-0.18951
1863	8	-2.00659	-2.69031	-0.45456	0.521271	-3.41614	-1.24445	-1.24445
1863	9	0.922638	-2.86694	-0.50345	1.12579	-2.43073	-1.89124	-1.89124
1863	10	-1.7504	-2.31796	1.47549	-1.00021	-0.26425	-0.82816	-0.82816
1863	11	-1.69043	0.51535	-1.44629	2.84018	-1.39948	-0.27225	-0.27225
1863	12	1.19156	-1.80258	0.936737	-0.80032	4.17267	5.44843	5.44843
1864	1	4.23685	-3.58749	1.10E-02	-0.71057	-3.86618	5.28568	5.28568
1864	2	2.07037	-0.62756	-3.92343	2.17078	0.874695	0.220703	0.220703
1864	3	-0.560059	-0.63532	0.162262	-2.41476	-2.0112	-1.06696	-1.06696
1864	4	1.89932	-3.01599	-2.59818	-0.37598	-2.26874	2.91122	2.91122
1864	5	0.643219	1.51132	-1.12973	-0.85178	-1.59528	-0.20371	-0.20371
1864	6	-2.50671	1.3595	-0.41428	1.08865	-0.93701	-1.05096	-1.05096
1864	7	-1.18414	-3.86798	-0.88464	-3.40463	-1.47803	-0.27661	-0.27661
1864	8	-0.620575	-1.26642	-4.46844	1.41989	-2.12253	-2.76E-02	-2.76E-02
1864	9	-2.75937	0.293335	-2.20306	-0.83939	-1.7218	-3.14413	-3.14413
1864	10	-1.9613	3.11746	-3.74429	-1.48682	0.363678	0.876251	0.876251
1864	11	2.93188	-0.86737	4.75E-02	-7.19711	-4.40927	2.43277	2.43277
1864	12	1.95306	-1.7493	1.08606	-2.32272	-1.61365	1.43301	1.43301
1865	1	6.10733	-1.40649	-4.19897	2.28244	1.15182	-1.49661	-1.49661

1865	2	8.90E-02	-6.50375	-5.96872	5.56461	3.3093	-0.22818	-0.22818
1865	3	-1.76984	0.668182	-4.09015	0.469543	1.4989	0.803345	0.803345
1865	4	-2.18008	0.957306	-2.7981	-0.34067	-0.29794	-1.72995	-1.72995
1865	5	-0.746582	-0.90369	-1.36932	1.75024	-0.96729	-2.065	-2.065
1865	6	7.87E-03	-0.2215	-1.24457	0.263947	-1.6929	-2.84195	-2.84195
1865	7	4.83E-02	0.337708	-1.95593	1.00558	0.257172	-1.3194	-1.3194
1865	8	-2.70E-01	1.5224	-2.56326	1.24707	7.52E-02	-1.82413	-1.82413
1865	9	-1.39789	1.81915	-9.86E-03	-1.40619	-2.69452	-0.94122	-0.94122
1865	10	-2.37921	1.93106	-0.78	-1.59543	-1.67844	-0.61246	-0.61246
1865	11	-0.28064	-1.82126	-3.4606	2.16489	2.38492	0.756073	0.756073
1865	12	1.56229	-2.0264	-4.09915	-0.39883	1.38046	4.53421	4.53421
1866	1	-3.65787	-3.90891	2.73175	2.32843	0.444336	7.53418	7.53418
1866	2	-2.62082	-4.35876	3.72797	1.711	1.28119	-1.15057	-1.15057
1866	3	1.77594	-1.80502	3.09598	2.80643	-1.1478	-0.67786	-0.67786
1866	4	3.05872	0.130615	0.986725	0.996033	1.29227	1.87204	1.87204
1866	5	-1.40189	0.826111	-0.25794	-2.68546	0.625732	1.00769	1.00769
1866	6	1.58539	-1.83319	-1.46857	-3.81973	-1.88419	-2.44745	-2.44745
1866	7	-1.92416	-2.32718	-1.14844	-0.16242	0.297699	-0.4628	-0.4628
1866	8	-1.39667	-3.3168	-1.28934	3.2067	-0.20682	-2.16034	-2.16034
1866	9	0.52182	-4.10754	-0.48846	1.55069	-0.30441	-0.88504	-0.88504
1866	10	0.201691	-1.33304	3.37421	-2.8645	-0.88464	-0.75397	-0.75397
1866	11	0.154968	-1.39697	2.87082	-3.58582	-2.60257	-0.91263	-0.91263
1866	12	1.48138	-1.96008	-1.42886	0.854492	-2.13333	-1.69778	-1.69778
1867	1	-4.05228	-3.68149	-5.06815	4.77414	0.397247	3.11429	3.11429
1867	2	3.30768	0.417328	-1.30203	-1.18292	2.41269	-2.35309	-2.35309
1867	3	0.733337	-0.8851	-1.74493	3.95065	2.11261	0.800232	0.800232
1867	4	0.108124	-0.48367	-3.72229	0.320129	1.95126	-0.49997	-0.49997
1867	5	-0.930603	-0.96158	-4.23022	2.91754	-0.88437	1.00742	1.00742
1867	6	-0.41391	-2.4238	-1.63486	-3.93576	-0.14648	0.237946	0.237946
1867	7	1.55954	-1.00668	-3.36133	2.26129	2.8342	-1.54141	-1.54141
1867	8	0.566925	0.597687	-5.11804	0.305878	-1.86603	-3.24762	-3.24762
1867	9	0.968536	0.562439	-3.19485	-5.06641	-1.9548	-3.68903	-3.68903
1867	10	-1.37912	1.39056	-1.66809	-5.52463	-1.19034	-0.52844	-0.52844
1867	11	0.116974	2.40115	-0.76111	3.03308	-0.26227	-1.20953	-1.20953
1867	12	-0.867828	-1.32898	-0.57465	-0.71521	0.940948	-3.87399	-3.87399
1868	1	0.308838	-0.8226	-2.60947	2.92883	-1.80878	3.40009	3.40009
1868	2	2.07257	-2.90497	-1.89041	0.641083	0.990204	-2.1803	-2.1803
1868	3	2.31625	-7.3717	1.07745	0.488342	-0.85458	-4.28217	-4.28217
1868	4	0.997406	-1.04938	2.6796	0.497345	0.858246	-3.65646	-3.65646
1868	5	8.48E-02	-0.4801	-1.53934	-1.41458	-1.92886	0.509216	0.509216
1868	6	-1.06934	-2.58908	-1.00626	-2.57236	-0.65988	1.60223	1.60223
1868	7	1.96146	1.64151	-0.20764	0.797577	-2.73203	-0.92511	-0.92511
1868	8	2.02582	0.781097	-0.99875	-0.55063	1.02759	-1.98663	-1.98663
1868	9	-0.635284	0.231934	0.886536	2.34451	-2.24811	-0.72452	-0.72452
1868	10	0.297302	6.78E-02	-1.28339	2.59589	-1.79703	0.331146	0.331146
1868	11	-1.93604	2.31653	-3.27078	1.59079	-3.87958	-2.43045	-2.43045
1868	12	0.372864	1.06631	1.51895	1.40457	-3.13855	-3.8559	-3.8559

1869	1	-1.71255	2.57401	4.14795	1.28915	-2.61078	3.09598	3.09598
1869	2	-2.24551	0.645721	3.58777	1.98639	0.481812	-7.93408	-7.93408
1869	3	-0.594543	-0.56992	-5.27985	3.80115	1.08072	1.44894	1.44894
1869	4	-1.1326	0.130524	-3.81549	-1.34058	2.63156	0.476227	0.476227
1869	5	0.208801	-0.396	-3.18784	-0.79318	-0.48407	0.299103	0.299103
1869	6	-2.09622	-3.06149	-1.32886	1.42316	-2.09189	0.756042	0.756042
1869	7	-0.948669	-4.409	-2.76624	0.441193	-0.80191	1.02499	1.02499
1869	8	-2.39539	2.89E-02	-5.02695	0.215576	-1.86792	-3.01764	-3.01764
1869	9	2.93E-02	-1.41534	-4.98956	0.681396	-1.14481	-4.03583	-4.03583
1869	10	0.804108	-1.92136	-3.05508	-1.21451	0.214874	-0.81427	-0.81427
1869	11	3.36E-03	-0.22894	-0.10169	0.429688	-0.63376	0.467468	0.467468
1869	12	2.06067	-2.9559	-0.95804	-4.80283	0.389252	-1.73538	-1.73538
1870	1	4.03912	-3.2674	8.76E-02	4.25375	3.11972	-0.9075	-0.9075
1870	2	-1.74393	2.71432	3.01208	-2.8808	1.80411	-1.36569	-1.36569
1870	3	2.21936	-2.79022	3.40155	0.585052	0.683502	2.06055	2.06055
1870	4	-1.09088	-0.33557	1.03983	-1.59058	0.621368	8.93E-02	8.93E-02
1870	5	-2.18518	-3.17007	1.54037	1.73233	1.20142	-0.40588	-0.40588
1870	6	-0.324921	-1.31219	0.149628	0.42395	-0.73459	-1.20456	-1.20456
1870	7	0.629333	1.37741	0.293671	-1.27121	0.46109	-0.69992	-0.69992
1870	8	0.362335	1.12408	1.76434	-1.14331	1.17087	-2.61053	-2.61053
1870	9	1.05414	2.13556	-0.11505	-1.44019	0.885773	-2.38843	-2.38843
1870	10	-1.74899	-1.12494	3.43781	1.70218	-1.07623	1.82425	1.82425
1870	11	1.31458	-1.74506	2.9949	0.348297	1.74344	0.402161	0.402161
1870	12	1.89838	-1.09778	-2.70667	-5.34933	-2.42105	-1.91867	-1.91867
1871	1	-2.14328	-3.18558	1.65964	-8.69055	0.62262	0.834686	0.834686
1871	2	-5.49121	-4.52747	-1.31281	-8.75E-02	-1.5173	-2.36249	-2.36249
1871	3	-0.488342	-0.72412	1.37558	0.767029	1.8732	-3.66675	-3.66675
1871	4	2.99301	1.1199	-3.0249	-4.13577	0.599365	-3.67E-02	-3.67E-02
1871	5	1.32E+00	-0.37909	-0.55792	-1.62695	-3.24E-02	-3.12311	-3.12311
1871	6	-9.03E-02	-1.2576	-0.78796	-0.42593	-1.95718	-1.08157	-1.08157
1871	7	-5.65E-02	-4.28888	-0.19632	-2.65424	-0.2265	-2.29471	-2.29471
1871	8	-0.520966	-4.16611	-0.41336	0.237091	0.589478	-2.71982	-2.71982
1871	9	-0.312286	-2.16785	-3.87314	-3.3739	-0.87323	-0.42804	-0.42804
1871	10	-2.07901	-1.52054	-1.12869	1.20767	-0.88974	-0.33707	-0.33707
1871	11	1.30786	-0.32327	2.22562	-4.4967	-1.80026	0.834961	0.834961
1871	12	7.84E-02	-1.36108	1.77765	2.15637	-5.82965	-0.96628	-0.96628
1872	1	-3.93475	-0.82278	2.61194	-3.14426	-2.20908	-0.85452	-0.85452
1872	2	1.02908	0.766724	-1.21402	-2.7998	-1.75781	8.98E-02	8.98E-02
1872	3	-0.757843	-1.29611	-0.14533	-2.06287	-0.50357	1.85333	1.85333
1872	4	1.54071	0.817505	-0.74408	-0.91428	-2.08356	-0.81525	-0.81525
1872	5	-0.983795	-0.84888	-1.42023	-0.39078	-0.13388	9.34E-02	9.34E-02
1872	6	-2.21582	2.92212	-0.47446	0.479065	-3.69708	-2.63385	-2.63385
1872	7	-2.31E+00	-0.4928	-2.40442	-2.44193	8.70E-03	-0.9964	-0.9964
1872	8	1.78992	-1.8212	-2.89307	-0.99381	-1.40143	-9.83E-03	-9.83E-03
1872	9	-0.643066	-2.54456	-0.82065	1.00571	0.146698	2.70978	2.70978
1872	10	0.994995	0.601044	-2.3765	-1.09311	-1.65555	1.19254	1.19254
1872	11	-1.08932	1.75714	4.1088	0.9086	-0.19595	-1.20593	-1.20593

1872	12	-6.44E-03	2.58862	-0.30817	-1.11093	-4.14896	-0.24008	-0.24008
1873	1	1.01083	2.0838	0.182953	-5.98505	-1.60437	6.298	6.298
1873	2	-3.04333	6.45E-02	-1.53503	-3.52591	1.52429	2.52863	2.52863
1873	3	-3.66315	0.56308	-2.86093	1.74155	-3.15869	2.81284	2.81284
1873	4	1.43E+00	0.794403	-2.63449	-2.79346	-4.71E-02	-6.23E-02	-6.23E-02
1873	5	0.384796	-0.7641	-0.91663	3.16382	-3.53668	-0.94431	-0.94431
1873	6	-0.91272	-3.1366	-2.00906	-0.48013	-1.04138	-1.55518	-1.55518
1873	7	-0.291046	-2.54279	-1.78442	2.90158	-0.92392	-0.5246	-0.5246
1873	8	-0.256683	-3.82471	-0.28436	-0.19852	1.52896	-2.57773	-2.57773
1873	9	0.960815	-3.96304	-2.12344	-0.96219	-1.02682	-2.60764	-2.60764
1873	10	1.79498	-0.33255	-0.44598	-2.28061	-0.67593	-1.62497	-1.62497
1873	11	-0.85022	-2.96027	2.01709	-0.8504	-2.18506	-1.52274	-1.52274
1873	12	-1.00613	-3.6955	1.53864	0.212677	-1.88535	-2.9397	-2.9397
1874	1	-4.04688	1.0773	-2.41907	1.48575	-3.78397	8.12939	8.12939
1874	2	0.992859	-1.80048	-0.74152	-3.2449	-0.15201	-5.63309	-5.63309
1874	3	-0.498444	-9.66E-02	2.16736	2.90845	3.01611	-2.81494	-2.81494
1874	4	-1.20929	1.0809	0.808502	6.26672	1.52927	-0.79117	-0.79117
1874	5	-0.456085	-2.39868	-1.74414	-1.70065	0.936737	-1.37509	-1.37509
1874	6	-0.310028	1.8707	9.45E-02	0.94165	0.2034	-1.30338	-1.30338
1874	7	-0.683167	-3.18158	1.48917	0.594269	-0.9841	-0.25711	-0.25711
1874	8	2.79782	-3.57312	-0.99616	0.565277	-1.62253	-1.29712	-1.29712
1874	9	1.51733	-1.68356	0.391937	0.243011	-2.82022	-2.57443	-2.57443
1874	10	-0.375092	0.84494	-1.34351	-0.72501	-1.07175	0.401733	0.401733
1874	11	-0.641144	0.108643	-1.70551	-3.23322	-0.55478	-2.15393	-2.15393
1874	12	1.26767	-1.18448	0.566437	1.29477	-7.61453	2.08032	2.08032
1875	1	2.47913	-2.6734	4.77213	1.75723	-2.58395	-1.30212	-1.30212
1875	2	-2.39001	0.242249	1.04968	4.2247	-0.91888	0.229004	0.229004
1875	3	-1.61285	1.62509	1.66696	2.98535	2.1286	2.66495	2.66495
1875	4	-1.81198	9.49E-02	-1.9429	0.660736	-0.53894	1.14905	1.14905
1875	5	-0.609985	3.41E-02	1.76077	-1.74268	0.342834	-1.92041	-1.92041
1875	6	1.30386	0.198517	-5.75E-02	-0.32816	-3.12561	-3.11606	-3.11606
1875	7	3.84793	-0.57929	-1.42422	2.85458	2.73398	-2.06592	-2.06592
1875	8	3.16602	-0.95071	-1.35016	0.718872	0.220062	-1.00772	-1.00772
1875	9	1.70792	-3.23987	-4.76324	0.196716	-2.2052	-4.52124	-4.52124
1875	10	-2.3049	-2.65475	-2.85861	-3.45941	1.15887	-1.43814	-1.43814
1875	11	2.89417	-0.30347	-2.46249	-0.97791	1.90863	1.70767	1.70767
1875	12	0.210876	-1.69818	-1.99097	-0.11423	-2.78696	2.56622	2.56622
1876	1	-0.581879	-0.55798	-2.25375	6.81165	0.782532	-0.67111	-0.67111
1876	2	-2.40002	-1.40097	-1.55203	0.700897	-2.56201	-2.40118	-2.40118
1876	3	4.82E-02	-3.46072	-1.86862	0.870239	-4.5578	-5.03687	-5.03687
1876	4	-2.2561	-2.25769	-1.25278	0.104736	-0.41565	2.45E-02	2.45E-02
1876	5	2.36261	-3.28809	-2.25793	-0.45618	-1.77277	0.351013	0.351013
1876	6	9.28E-03	1.17792	-0.71518	-2.13535	0.906097	-1.07178	-1.07178
1876	7	0.553131	1.35031	-0.38162	-0.88571	-1.11301	-0.427	-0.427
1876	8	-6.82E-01	-0.64151	-2.75735	-2.06122	-9.95E-02	-1.27112	-1.27112
1876	9	-3.44647	0.176239	-4.12695	0.678589	-1.86252	-0.84442	-0.84442
1876	10	1.96469	-0.55765	0.496307	-2.26773	1.15036	-2.69257	-2.69257

1876	11	3.11996	0.572937	9.10E-02	1.66879	-1.31317	-2.66425	-2.66425
1876	12	-1.33221	-3.2067	0.998352	-1.53E-02	1.20004	-6.54138	-6.54138
1877	1	-5.74896	-0.8443	4.23065	-0.30255	-3.40488	-3.08731	-3.08731
1877	2	-2.85062	-1.05E-02	-1.14963	2.11218	-0.64938	-5.71127	-5.71127
1877	3	0.220154	1.19049	3.44525	0.301025	-0.36047	-2.60394	-2.60394
1877	4	1.1203	-0.15527	2.27271	0.983551	-2.22916	-2.92947	-2.92947
1877	5	-0.293579	-0.2038	-0.90814	2.34122	-4.57648	-2.8555	-2.8555
1877	6	-0.679718	0.643799	-0.65506	2.86264	0.657715	-1.66925	-1.66925
1877	7	-0.674652	1.2377	-1.15744	-9.63E-02	2.4231	-2.75012	-2.75012
1877	8	-0.80838	3.09198	-1.03265	0.148895	-0.57721	-2.26743	-2.26743
1877	9	-4.54156	2.47665	-1.84485	0.811188	-3.45093	-3.05554	-3.05554
1877	10	-1.7052	-0.15094	1.11002	-1.41251	1.99875	-2.40936	-2.40936
1877	11	1.13486	-0.21866	-2.49161	-3.43652	-1.59558	-4.59973	-4.59973
1877	12	0.74646	-3.2403	-0.51144	-0.72641	0.552856	-2.04709	-2.04709
1878	1	-2.41306	-3.7648	-3.54688	-1.82657	2.28214	0.843781	0.843781
1878	2	-3.58054	3.40573	2.05597	-1.72931	0.106903	-6.2366	-6.2366
1878	3	-2.24924	0.756592	0.639252	-3.97745	-2.16739	-0.15765	-0.15765
1878	4	-2.59E-02	-2.02579	1.2005	-0.47015	2.16864	-2.47815	-2.47815
1878	5	-1.14218	-0.38809	-2.09085	-0.35007	-1.42087	7.21E-02	7.21E-02
1878	6	-2.19943	0.831604	1.17032	-1.81845	-1.13809	-0.96777	-0.96777
1878	7	0.251831	0.903717	-2.66074	-3.26941	-0.89243	-2.8721	-2.8721
1878	8	0.578033	-0.6358	-0.61734	0.224792	0.614868	-3.06494	-3.06494
1878	9	-1.63629	-0.48215	-2.15845	2.03729	-0.72681	3.45E-02	3.45E-02
1878	10	-3.56461	-0.66495	0.373993	0.578796	-2.83414	-1.69916	-1.69916
1878	11	-1.58243	0.533539	-1.83459	3.47388	0.507141	0.528351	0.528351
1878	12	1.50656	-0.44309	-3.47165	3.97519	3.58105	1.81912	1.81912
1879	1	0.183319	1.6723	1.18124	2.59335	-4.00266	4.02448	4.02448
1879	2	-0.473419	-2.70416	0.429565	1.89349	-3.34171	-1.4357	-1.4357
1879	3	-2.23315	-2.0983	3.57507	1.65955	-0.26199	-2.11716	-2.11716
1879	4	-1.92389	0.535126	-5.98E-02	1.07584	-1.20496	-0.36816	-0.36816
1879	5	-3.91449	-0.34567	-1.81464	-2.11386	-1.80777	-1.8165	-1.8165
1879	6	-3.97931	-3.71008	-2.41016	-2.03714	1.0437	-0.56168	-0.56168
1879	7	-2.97964	0.3349	-1.51172	-2.11414	1.50778	-2.85541	-2.85541
1879	8	-2.02948	0.613403	-2.98746	-1.3663	0.220062	-1.97662	-1.97662
1879	9	-2.05807	-2.50244	-2.35495	4.0101	0.307587	-2.15024	-2.15024
1879	10	-0.256592	-1.17E-02	-1.93671	-2.85892	-2.19833	-1.78094	-1.78094
1879	11	-2.99564	-2.17227	-0.10169	-1.73941	-0.50006	-0.42615	-0.42615
1879	12	1.69958	-0.89688	0.725159	3.62198	-0.85513	1.09763	1.09763
1880	1	1.84744	-5.80E-04	3.53693	-2.85556	-0.70758	2.97409	2.97409
1880	2	-2.95593	0.848145	2.73038	-5.51572	2.56491	1.76743	1.76743
1880	3	0.356354	-0.25412	-1.11282	0.105652	0.993225	3.11554	3.11554
1880	4	1.6937	-1.40479	-1.37939	-2.89386	-1.66025	-5.83E-02	-5.83E-02
1880	5	-0.683289	6.69E-02	-2.48413	1.46323	-0.30359	-1.33899	-1.33899
1880	6	-0.715637	1.57581	-0.37546	0.336853	-2.42719	0.29953	0.29953
1880	7	4.33963	-2.78E-02	-1.40814	-0.22153	-2.25522	0.199188	0.199188
1880	8	9.03E-03	2.125	-2.95737	-0.67423	-2.10751	-1.66434	-1.66434
1880	9	2.00702	-0.47784	-4.60254	0.154114	-1.11722	-0.46292	-0.46292

1880	10	-2.02539	1.63596	-4.10471	-2.3179	1.40897	0.618652	0.618652
1880	11	-0.236542	1.14154	-6.19919	-3.50351	0.697418	-4.86633	-4.86633
1880	12	-0.134521	-1.33E-02	-0.76254	3.13687	-1.78235	-2.21347	-2.21347
1881	1	0.121124	-1.66608	1.78503	-0.73236	0.879822	-1.92862	-1.92862
1881	2	-2.38373	1.76465	-3.35541	-5.11081	-1.21368	-0.80939	-0.80939
1881	3	-2.49677	-0.35281	0.138062	-1.80585	-1.03738	-1.93915	-1.93915
1881	4	0.412506	-1.99377	-2.07199	-2.94046	-1.34076	-1.50687	-1.50687
1881	5	-3.78638	-2.65417	0.244659	0.918518	-1.82867	-7.59E-02	-7.59E-02
1881	6	-0.53302	1.01273	-1.68698	-0.59534	0.787201	-2.31567	-2.31567
1881	7	-8.22E-02	0.854004	0.135284	2.57977	-0.57953	-2.4614	-2.4614
1881	8	-1.25928	-1.72913	-2.48975	-0.34262	-0.47974	-1.52985	-1.52985
1881	9	0.938019	-2.59106	-2.23746	-3.44E-02	1.36868	-1.15244	-1.15244
1881	10	-2.61801	-3.49207	-1.60791	0.360291	0.744263	0.325958	0.325958
1881	11	-0.558716	-0.77017	0.108795	0.994995	-1.89127	-3.91583	-3.91583
1881	12	2.44138	-2.5033	-4.33405	3.50818	0.632263	1.51022	1.51022
1882	1	-1.69186	0.700623	-2.78076	0.310547	-1.73776	4.9989	4.9989
1882	2	0.65448	2.48795	0.318573	1.76511	3.07642	-0.71408	-0.71408
1882	3	0.977234	1.24948	2.21396	3.94183	0.697205	-0.12106	-0.12106
1882	4	-1.0802	-3.80038	-0.5022	-0.29327	1.48157	-0.89835	-0.89835
1882	5	-4.08038	-2.6387	-3.44354	-4.46356	1.19571	-3.50018	-3.50018
1882	6	-0.33902	4.30E-03	-2.43518	-1.10614	1.08762	0.185425	0.185425
1882	7	-1.38766	-3.22638	-1.61942	-0.26892	-0.53162	-2.16422	-2.16422
1882	8	0.138123	-1.16953	-4.41754	2.04868	-0.56903	-1.12534	-1.12534
1882	9	0.403137	-1.04547	-4.16116	0.5177	0.711578	-1.92743	-1.92743
1882	10	-0.531891	-0.69534	1.25381	0.86499	2.61386	0.134857	0.134857
1882	11	-2.11893	3.67215	0.96051	1.70969	-0.78287	-1.74072	-1.74072
1882	12	4.21698	0.936218	-0.23175	3.13528	-0.62744	-1.46909	-1.46909
1883	1	2.18802	-1.45789	-1.21426	4.25714	-2.36215	3.86E-02	3.86E-02
1883	2	0.714478	4.64664	-0.58243	2.98788	-0.8392	1.12131	1.12131
1883	3	1.70596	-1.14612	1.30835	-1.52017	-0.16919	-2.65216	-2.65216
1883	4	0.606506	-2.21188	-2.9772	-2.23425	-0.61774	-2.30307	-2.30307
1883	5	-0.623688	-1.77917	-1.04254	-1.99347	0.433014	-3.81699	-3.81699
1883	6	-0.267029	-1.04498	-1.61356	-0.39914	0.418213	-1.93488	-1.93488
1883	7	2.12E+00	-1.995	-2.30743	-2.56302	-8.30E-03	-1.89801	-1.89801
1883	8	-1.87518	-0.3269	-5.89334	-0.23703	-2.00711	-4.06604	-4.06604
1883	9	-1.59756	-1.88367	-5.55084	-2.99E-02	-1.22992	-0.92114	-0.92114
1883	10	-1.57849	1.35336	-2.34961	-1.53851	0.601959	-2.77585	-2.77585
1883	11	-0.757538	1.43414	0.201508	5.14029	0.707947	-0.36203	-0.36203
1883	12	2.18417	1.66861	-2.56757	-0.84763	-0.17374	0.224426	0.224426
1884	1	-2.23135	-1.50168	-0.66556	-3.83487	-4.18918	2.65048	2.65048
1884	2	4.67126	1.56924	0.402893	-5.91052	3.40369	2.05621	2.05621
1884	3	0.407562	1.05859	-0.10175	-1.92587	-2.3089	-1.48944	-1.48944
1884	4	-0.119904	0.536011	-2.75928	3.77563	-0.58905	-0.95465	-0.95465
1884	5	-2.89301	-0.15418	-1.77103	-0.43286	0.704712	-2.0379	-2.0379
1884	6	0.684479	1.20901	-2.97287	-2.58786	-3.61688	-2.13126	-2.13126
1884	7	1.05234	-1.16809	-4.83563	-3.24893	-3.59811	-2.27231	-2.27231
1884	8	-0.991882	-0.45541	-5.24194	-3.42871	-4.97903	-2.81512	-2.81512

1884	9	-0.797089	-2.55237	-4.26474	-1.93201	-2.94391	-6.47153	-6.47153
1884	10	-0.1091	-0.82336	-0.46149	-3.02771	-1.55533	-1.23645	-1.23645
1884	11	-1.70853	0.409546	-1.6908	-1.24863	-0.37448	0.972961	0.972961
1884	12	2.57956	-3.5256	-1.36465	3.95178	-5.72125	0.150024	0.150024
1885	1	4.83743	-5.2301	-4.12057	-2.37787	0.39212	3.5498	3.5498
1885	2	0.318573	-1.25766	-2.57562	-2.57401	-2.74301	-1.40359	-1.40359
1885	3	0.401642	-2.39111	-2.67773	-1.43826	-1.35989	1.59973	1.59973
1885	4	9.30E-02	-0.37479	1.24561	-2.86145	-2.49805	-3.13235	-3.13235
1885	5	0.321899	1.86972	-3.68143	-4.68207	-1.07739	-0.32001	-0.32001
1885	6	-0.795624	-2.09509	-1.36066	-3.64624	-2.87698	-3.50967	-3.50967
1885	7	0.602631	-1.89447	-0.94284	1.05527	-4.65872	-2.0726	-2.0726
1885	8	9.43E-03	-4.3688	-5.27765	1.42407	-3.05203	-1.66605	-1.66605
1885	9	0.431732	-2.64197	-2.40186	1.42761	-1.16861	-0.62064	-0.62064
1885	10	-0.707916	-1.74875	-2.07269	-1.68152	-1.40424	-2.24265	-2.24265
1885	11	0.222382	0.627228	-4.44931	1.25818	0.244019	-3.42474	-3.42474
1885	12	2.03238	-4.92538	-0.55347	-0.22672	-6.89044	-1.73999	-1.73999
1886	1	-7.51E-02	0.974915	3.80145	-1.30847	-3.12167	-1.58871	-1.58871
1886	2	-1.08362	0.811829	-1.76431	-5.37411	-3.05219	-4.69418	-4.69418
1886	3	-2.92194	2.69E-03	0.242371	-1.98526	-0.9296	-3.07596	-3.07596
1886	4	-0.104279	-0.6825	-0.5076	3.61185	-2.27383	-1.62115	-1.62115
1886	5	0.216919	2.11E-03	-2.07483	-1.82117	-1.48599	-1.97861	-1.97861
1886	6	-1.10403	-1.2717	1.04865	-0.31674	-0.47611	-2.42596	-2.42596
1886	7	1.30945	-2.0528	-3.52484	-0.18323	-1.64893	-2.04181	-2.04181
1886	8	-0.908478	-1.94571	-3.26736	1.90637	-1.22763	-3.36365	-3.36365
1886	9	1.26651	-1.31485	-2.44934	-0.35001	-0.46613	-3.64902	-3.64902
1886	10	1.40891	-2.69116	-2.56091	2.05789	0.227875	-2.39377	-2.39377
1886	11	-4.40604	1.75635	-1.74701	-0.97421	2.26114	1.77698	1.77698
1886	12	1.47E+00	-2.48779	-1.76266	-1.70E-02	-2.11E-02	1.01331	1.01331
1887	1	1.37442	-0.95178	-10.0265	2.08865	-2.80496	0.699097	0.699097
1887	2	-2.63443	-1.08676	-2.87091	-0.31271	0.423309	-3.39679	-3.39679
1887	3	-2.52945	2.0538	-4.92282	-1.79645	-4.1825	-1.48215	-1.48215
1887	4	-2.40509	-1.11349	-5.8074	-0.46826	-1.17636	-0.76947	-0.76947
1887	5	-1.69089	0.116913	-6.97E-02	-1.76007	1.47763	0.490295	0.490295
1887	6	-1.12534	-1.35269	-0.17758	-1.25644	-0.58081	-1.31897	-1.31897
1887	7	-0.386749	-1.37857	-1.32144	-2.31781	-1.10272	-3.1015	-3.1015
1887	8	1.00281	-2.60501	-1.57254	1.51849	-0.98154	-2.32404	-2.32404
1887	9	-6.95E-02	-1.47916	-2.76456	-2.59509	1.44537	-2.71924	-2.71924
1887	10	-1.2847	-3.48816	-2.11639	2.55319	-0.94144	-3.78564	-3.78564
1887	11	2.92E+00	2.21094	3.06E-02	4.33978	-4.45E-02	0.971649	0.971649
1887	12	-7.17E-02	1.9046	-2.77347	0.696564	0.376648	-0.87558	-0.87558
1888	1	-5.62338	1.66342	-3.18887	-2.11835	0.118225	-4.3421	-4.3421
1888	2	-2.25443	-1.01016	-0.99371	-1.70462	0.461609	3.72E-03	3.72E-03
1888	3	0.758057	-0.43921	-1.04825	-1.40225	0.479828	-2.95697	-2.95697
1888	4	-1.47348	0.458923	1.49301	1.43863	0.184967	-2.91345	-2.91345
1888	5	-1.33588	-2.13919	0.364777	-2.03708	-1.55676	-2.42068	-2.42068
1888	6	-0.966736	2.64441	-0.36896	0.454956	-0.6922	-2.00446	-2.00446
1888	7	-2.75867	-1.9263	-0.77304	-1.52673	-0.18253	-2.49182	-2.49182

1888	8	-1.73898	0.197174	-2.14346	-2.88791	-4.86594	-2.44495	-2.44495
1888	9	-0.493591	-2.03885	-2.97946	-4.61E-02	-2.10083	-4.33582	-4.33582
1888	10	-0.856293	-0.57175	-0.836	-3.6333	-2.93573	0.833954	0.833954
1888	11	0.345673	7.87E-02	-1.5752	2.46768	-2.89438	-5.64594	-5.64594
1888	12	0.821564	2.90E-02	-4.41916	2.79376	-1.10864	-0.77008	-0.77008
1889	1	-3.17868	1.83432	1.74915	3.36694	0.330048	1.20358	1.20358
1889	2	-4.03131	2.36032	3.40637	-1.24301	-2.47449	-3.65408	-3.65408
1889	3	-0.323059	1.70148	-4.60E-02	-1.61047	0.768829	-1.24756	-1.24756
1889	4	-4.17178	-2.22708	-3.5415	-0.95795	0.241241	-1.70285	-1.70285
1889	5	-3.6127	0.496124	-0.17603	-1.81818	0.695831	-0.42969	-0.42969
1889	6	-1.98453	-1.0007	-1.56567	1.74554	0.308716	-1.94107	-1.94107
1889	7	-1.36057	-0.91217	-2.06082	1.62466	-0.61932	-2.4874	-2.4874
1889	8	-3.48407	-1.71881	-3.03656	-1.49142	-3.24683	-1.46683	-1.46683
1889	9	-2.33E-02	-0.81085	-4.15286	4.08139	-1.74182	-3.54364	-3.54364
1889	10	-2.44131	0.26825	0.356995	1.418	-1.09793	-3.61566	-3.61566
1889	11	-1.64453	-1.73434	-1.70718	-0.52991	-2.58118	0.653259	0.653259
1889	12	0.937164	-1.07208	-0.35046	5.35559	0.711548	-2.70038	-2.70038
1890	1	0.543121	0.894623	1.49335	2.74515	-1.35077	0.447083	0.447083
1890	2	-3.41403	-0.41498	2.00787	1.0253	-2.67081	-3.68298	-3.68298
1890	3	3.24915	1.21439	1.07108	1.35983	-1.2334	0.678741	0.678741
1890	4	-0.483185	0.215912	4.63E-02	-2.29837	0.181244	-2.11517	-2.11517
1890	5	-2.56339	-3.0148	-2.19003	-2.41437	-1.46527	-1.0047	-1.0047
1890	6	-1.77042	1.0224	-0.37686	-1.30396	0.915009	0.603638	0.603638
1890	7	-1.60617	-1.74289	-0.85422	-3.13913	-1.31741	-0.5032	-0.5032
1890	8	0.299316	-0.1322	-1.41367	-3.89383	2.58496	-2.77524	-2.77524
1890	9	-1.14E+00	1.56055	1.00134	3.08E-02	4.29E-02	-3.27911	-3.27911
1890	10	0.283508	-0.24677	1.22601	-4.022	0.505371	-2.04456	-2.04456
1890	11	-2.72842	4.62714	-3.67648	-2.98752	-0.21027	-2.48334	-2.48334
1890	12	-4.90982	0.436523	-3.65115	0.568268	2.97354	1.18582	1.18582
1891	1	-1.99017	-0.11829	-3.01505	0.540558	0.158325	0.794586	0.794586
1891	2	-1.66843	3.61804	0.273865	1.1972	-9.4856	3.78281	3.78281
1891	3	1.71594	-0.9115	3.14505	2.01324	1.85492	0.929657	0.929657
1891	4	-1.1861	-1.90659	0.663422	-0.67258	-2.46094	-0.29315	-0.29315
1891	5	0.91391	-1.46368	0.654449	-3.41446	-1.91437	-0.198	-0.198
1891	6	1.87927	1.4711	0.438721	-1.32004	-4.07159	0.259644	0.259644
1891	7	-0.969055	2.18842	3.62115	0.691376	-1.83762	-3.07861	-3.07861
1891	8	-0.761963	-3.44E-02	-0.28656	-1.46283	-1.07114	-2.19943	-2.19943
1891	9	-1.83517	-1.04095	-0.10864	-3.10721	-2.41891	-2.47202	-2.47202
1891	10	-0.953308	0.718445	0.196106	-3.79352	-2.01004	2.93E-03	2.93E-03
1891	11	-0.237122	-1.03836	0.890808	-6.85291	-1.47626	-3.46704	-3.46704
1891	12	2.15036	-2.4126	-2.86026	-3.17651	-5.21515	0.919525	0.919525
1892	1	0.87384	-0.75458	-3.57077	-0.87915	-3.49506	-0.39752	-0.39752
1892	2	1.82846	-1.13956	-2.28473	-3.8157	-2.11551	-4.67297	-4.67297
1892	3	4.77905	1.9046	-0.16904	-2.36615	-0.87997	-3.01834	-3.01834
1892	4	1.49512	-0.88757	0.825623	3.21E-02	0.103546	-5.17346	-5.17346
1892	5	-1.8732	-0.77148	-1.63855	2.20114	-1.24597	-1.97528	-1.97528
1892	6	3.19879	2.00772	-0.54688	0.910553	-2.53339	-1.01666	-1.01666

1892	7	1.16254	-1.12259	-1.23553	0.911987	-0.61081	-3.02521	-3.02521
1892	8	-1.27097	3.0022	-2.60895	-2.5856	-2.57953	-1.54922	-1.54922
1892	9	-1.50217	-2.70285	-2.45377	1.14401	-0.45612	-3.08762	-3.08762
1892	10	5.76E-02	-0.98386	-2.21109	-0.92731	-1.40375	-3.25125	-3.25125
1892	11	2.85947	-0.59067	0.895416	1.12598	-0.60776	-3.87784	-3.87784
1892	12	1.28766	-2.15479	5.37036	1.89288	1.41147	-0.16217	-0.16217
1893	1	-1.45117	-2.36478	1.32315	2.43375	-1.18356	3.66559	3.66559
1893	2	2.99869	0.819427	4.09708	2.85999	-3.89859	-3.77838	-3.77838
1893	3	3.12814	-1.67133	2.78348	3.85333	-2.32169	-2.19525	-2.19525
1893	4	-0.398682	1.0903	-1.44098	-4.49747	-2.26566	-2.35675	-2.35675
1893	5	0.534821	-1.5199	-1.20624	-1.18198	0.272034	-1.32889	-1.32889
1893	6	0.370392	-2.6947	-1.22058	0.843353	-0.1366	-0.47626	-0.47626
1893	7	-0.582367	-2.00427	1.40927	-1.46512	-1.54831	-0.59531	-0.59531
1893	8	1.60721	-0.29602	-0.10806	3.18527	-0.76941	-0.30832	-0.30832
1893	9	-0.167969	-2.61887	-1.99194	-3.9021	1.69748	-2.94763	-2.94763
1893	10	0.376709	2.20944	-2.93939	-6.76672	-2.03433	-1.99185	-1.99185
1893	11	0.994263	-0.74146	1.61981	0.993591	1.65125	-1.87152	-1.87152
1893	12	1.56296	-3.55988	-0.26856	-2.61884	-0.54706	0.803925	0.803925
1894	1	3.39124	-1.03928	-4.39105	-0.90497	-1.97318	0.780579	0.780579
1894	2	2.06326	2.28903	1.93927	0.891479	-2.98529	7.23E-02	7.23E-02
1894	3	0.524963	0.803284	-3.73685	0.569153	-1.96048	2.43375	2.43375
1894	4	-0.532684	-2.21448	-2.203	0.491852	-1.44986	0.964233	0.964233
1894	5	-6.63E-02	-0.95139	0.508453	1.10544	-1.43347	-1.42349	-1.42349
1894	6	-2.88681	1.65851	-3.22656	-4.26675	1.58292	-0.97788	-0.97788
1894	7	-2.36887	-1.70718	-2.67783	-3.51804	-0.2525	-2.16641	-2.16641
1894	8	-2.00348	-0.47992	-2.63614	2.95349	1.75006	-2.06323	-2.06323
1894	9	1.80783	-2.46677	-0.49655	2.44409	1.22177	5.92E-02	5.92E-02
1894	10	-0.643616	-0.31296	-3.48871	-2.60452	0.754578	-3.54367	-3.54367
1894	11	0.480469	-0.70905	-2.76691	-0.77811	-0.71127	1.05948	1.05948
1894	12	-1.53964	-1.48578	-4.70087	5.94788	2.03247	-2.67108	-2.67108
1895	1	-2.18338	-0.758	0.282745	2.68594	-3.87448	-0.58051	-0.58051
1895	2	2.27878	-5.33307	0.885071	3.92859	-1.39499	-2.4877	-2.4877
1895	3	1.07205	-2.83481	1.00516	0.294525	-2.00607	-2.93665	-2.93665
1895	4	-3.03738	-2.08069	2.9415	0.393738	1.77527	-5.16727	-5.16727
1895	5	0.554596	-1.3671	1.44537	-0.61798	-0.62238	0.230103	0.230103
1895	6	-1.03781	-9.28E-02	0.538818	1.90305	-1.81049	-2.59515	-2.59515
1895	7	-2.28366	-1.94019	0.461456	-1.99203	1.04819	-2.64212	-2.64212
1895	8	-0.423492	1.43518	-0.16296	4.37418	1.83469	-6.29E-02	-6.29E-02
1895	9	0.716522	6.56E-02	-0.37045	-0.53479	0.571686	-0.99762	-0.99762
1895	10	2.05231	-0.75305	-6.72018	2.16699	-1.41052	-3.53265	-3.53265
1895	11	5.64E-01	1.75815	-0.73169	0.263	-9.45E-02	-1.04074	-1.04074
1895	12	0.128479	-1.61499	2.14874	-0.13141	0.620148	0.746826	0.746826
1896	1	3.07993	0.733917	5.28094	-1.86707	0.311523	3.55319	3.55319
1896	2	0.430664	4.11365	5.67267	0.818604	-2.39871	-0.50809	-0.50809
1896	3	-0.60675	0.39209	3.31186	-3.21606	-0.55258	-1.22116	-1.22116
1896	4	1.22192	-2.12567	-1.70059	-2.80106	-1.25894	1.65253	1.65253
1896	5	-2.33679	0.812622	-9.69E-02	-2.57077	-1.34329	-1.09531	-1.09531

1896	6	1.78958	-0.74649	-1.10986	1.06796	-0.39398	-0.30856	-0.30856
1896	7	1.33475	-2.17047	-0.63962	0.783966	0.837982	0.541382	0.541382
1896	8	3.28732	0.775787	-2.36584	1.81128	-1.34933	-0.98364	-0.98364
1896	9	2.03082	-2.04565	-4.04105	2.21201	-0.72751	-0.41492	-0.41492
1896	10	-3.8082	0.886047	1.44171	-1.05911	-0.37784	2.33615	2.33615
1896	11	-2.26233	2.54834	-1.4144	-0.74951	2.48975	1.13016	1.13016
1896	12	-3.37653	-1.86578	-2.20566	-4.93E-02	-0.21585	-2.56497	-2.56497
1897	1	-3.42548	-5.15198	-3.27985	2.32364	3.57184	-5.11182	-5.11182
1897	2	-3.37433	0.558838	-1.53922	2.01929	-0.65299	-5.23428	-5.23428
1897	3	0.52536	1.638	-2.88043	2.36914	-2.01068	-2.86636	-2.86636
1897	4	1.73621	-2.32349	-2.0372	-0.80228	-2.11676	0.547241	0.547241
1897	5	3.02142	-1.33578	0.643768	-3.04416	-0.29959	-0.54388	-0.54388
1897	6	-4.27E-04	-2.2027	1.12372	-2.31995	-0.92889	-1.48947	-1.48947
1897	7	-1.01825	-3.26349	1.26886	-1.80371	-0.40561	-2.2518	-2.2518
1897	8	-1.58298	-3.2807	-0.45526	1.26968	-0.36221	-2.74414	-2.74414
1897	9	-0.185577	-1.62216	-2.19345	1.72421	-0.17853	-1.91733	-1.91733
1897	10	-2.6427	-3.68646	-1.59009	1.48428	-0.64835	-1.24106	-1.24106
1897	11	0.90686	-0.95865	-0.41528	1.04099	-1.78156	-0.77765	-0.77765
1897	12	-2.28372	-0.2182	-4.22476	1.50528	-4.99884	-1.59457	-1.59457
1898	1	0.618835	-2.79999	2.22433	7.91623	-4.47568	-5.1994	-5.1994
1898	2	2.35889	2.16183	5.91049	-0.47611	4.65771	-2.7746	-2.7746
1898	3	-2.92E-02	-2.75E-02	-1.27072	-0.86505	-0.45767	1.87384	1.87384
1898	4	-0.995087	-1.20758	-1.78439	2.17764	-0.29956	1.84305	1.84305
1898	5	-1.29E+00	-1.26538	-0.24603	-3.44876	-9.11E-02	0.86499	0.86499
1898	6	1.04987	2.18002	0.201019	-4.94086	-0.77301	-2.35577	-2.35577
1898	7	-1.90945	-0.46729	-2.36673	-4.88043	-0.3031	-1.3642	-1.3642
1898	8	-0.507385	-3.70E-02	0.347839	-2.24741	-1.72012	-1.26105	-1.26105
1898	9	0.667938	-2.57974	-0.69696	0.811188	-0.88001	-0.83173	-0.83173
1898	10	2.11E-01	-3.15524	-0.72131	0.700684	-7.93E-03	1.17773	1.17773
1898	11	0.749359	0.329437	8.58E-02	-0.36063	-0.38257	0.969452	0.969452
1898	12	-0.257416	-3.1221	1.88986	-1.64981	-1.12595	-1.11758	-1.11758
1899	1	-2.25E+00	-4.4147	2.46814	-0.81805	-7.57E-02	3.4144	3.4144
1899	2	-1.47992	-3.02286	2.05527	-0.51251	1.55771	-5.26108	-5.26108
1899	3	2.30E-02	-2.41302	2.14957	2.02274	0.63382	0.494141	0.494141
1899	4	-0.433685	1.55511	2.54672	-0.88745	0.451569	-1.38696	-1.38696
1899	5	1.3959	-1.31299	-0.85184	-3.00876	1.39911	-1.8768	-1.8768
1899	6	6.68E-03	-4.42328	0.577026	-0.42554	-1.59698	-2.58475	-2.58475
1899	7	0.528656	-0.4068	-8.38E-02	-1.12283	-1.96683	-2.2966	-2.2966
1899	8	-0.640289	-0.49731	-0.96454	-1.0834	-2.38681	-0.93094	-0.93094
1899	9	1.45581	-0.77655	-3.25977	-1.35638	-3.35022	-3.68604	-3.68604
1899	10	-1.565	-1.20526	-1.80978	1.94318	2.53207	-2.12015	-2.12015
1899	11	-0.63382	1.28995	2.7413	1.9415	-2.30417	-0.76074	-0.76074
1899	12	-1.70633	-0.4848	0.542633	-0.69031	-3.82104	-0.10889	-0.10889
1900	1	-1.93E-02	-2.37469	3.16193	1.80255	-2.47818	-5.345	-5.345
1900	2	-5.28534	-6.25867	5.39099	-2.77591	1.64371	-0.96878	-0.96878
1900	3	-5.33E-02	1.41068	1.18405	-1.95056	1.81873	0.400635	0.400635
1900	4	-1.6286	-0.91168	-4.2547	2.96194	-2.97885	-1.79666	-1.79666

1900	5	-1.34E+00	2.4906	-2.45374	-0.80997	2.72E-02	-0.6409	-0.6409
1900	6	-3.55182	-0.78098	2.75E-03	-1.65283	-1.1611	-1.38257	-1.38257
1900	7	-1.47476	-1.97137	2.40408	-2.14783	2.62878	-1.3638	-1.3638
1900	8	-1.88187	2.18369	1.55554	-0.82901	2.67328	-0.99674	-0.99674
1900	9	-1.29288	-1.61215	-1.66165	-1.25519	-1.7012	-1.59314	-1.59314
1900	10	1.8002	-0.82105	0.130493	-4.57632	0.377869	0.997955	0.997955
1900	11	-2.84543	-1.09116	2.35422	1.40457	2.52362	-3.79E-02	-3.79E-02
1900	12	-1.35492	-0.70309	-1.52866	2.89548	-1.64426	3.7662	3.7662
1901	1	-1.19305	-3.2218	-4.76547	-1.51935	-0.45316	1.11838	1.11838
1901	2	-1.33472	-1.29758	-5.51913	-2.3017	1.63779	1.67331	1.67331
1901	3	-0.166565	-2.39572	-2.15195	-3.81866	-0.94647	-1.44296	-1.44296
1901	4	1.63791	-3.20929	-0.77289	-0.22977	1.33057	-0.80396	-0.80396
1901	5	-1.2739	0.132324	6.32E-02	0.246643	1.69073	-2.32361	-2.32361
1901	6	1.33347	1.94373	-1.97458	-1.72705	-1.26279	-1.53607	-1.53607
1901	7	-1.26816	0.381927	-3.31793	2.02298	0.757874	-2.14761	-2.14761
1901	8	0.765411	-5.92E-02	-2.90204	-1.99661	1.26758	-1.26624	-1.26624
1901	9	-5.67047	1.28003	-2.78937	-2.07291	-0.34381	-1.06314	-1.06314
1901	10	0.39859	1.71494	-2.9259	-2.70251	0.229156	1.71283	1.71283
1901	11	-1.07513	2.42804	-1.1958	-0.61121	1.33194	0.893372	0.893372
1901	12	-0.172333	-0.19919	-2.23627	3.52957	1.43726	1.00882	1.00882
1902	1	2.61194	-1.3197	-1.51166	-8.06E-03	0.353546	7.72598	7.72598
1902	2	-0.835022	0.932037	-5.78632	1.00888	-2.81729	0.936707	0.936707
1902	3	-4.58E-02	4.7496	0.816559	-1.26465	-1.23788	0.682739	0.682739
1902	4	-8.88E-02	-1.07718	-7.42999	-2.89996	-1.64136	2.51694	2.51694
1902	5	0.926697	1.2641	-3.92255	-2.75406	-0.60858	-0.62091	-0.62091
1902	6	-1.55273	1.9491	-0.66486	-0.89096	-1.13101	0.573029	0.573029
1902	7	-0.349762	-1.1355	-2.44193	-0.74674	-0.93121	-0.3136	-0.3136
1902	8	-0.524292	-2.67E-02	-1.27695	2.30029	1.02426	-2.55804	-2.55804
1902	9	-1.17E+00	-3.34036	-1.29004	1.9144	9.32E-02	-1.25903	-1.25903
1902	10	-1.02029	-3.10016	1.02332	-0.85761	0.792175	1.16525	1.16525
1902	11	-0.570618	2.14E-03	1.53992	2.31808	1.34573	2.27E-02	2.27E-02
1902	12	-0.273621	-0.78699	-0.75934	-0.48023	0.331055	1.13272	1.13272
1903	1	3.79993	-1.30438	-0.45535	5.75424	-0.82538	3.96017	3.96017
1903	2	2.34796	-5.98517	1.55429	-2.09451	3.7049	-0.3013	-0.3013
1903	3	-2.20435	-2.4512	-0.64945	-2.29437	1.00482	-2.71747	-2.71747
1903	4	-3.66928	-2.89987	-1.38748	0.257233	1.33914	-2.98785	-2.98785
1903	5	-2.26059	-1.0076	-2.17493	-1.75967	-1.65988	-3.32251	-3.32251
1903	6	-1.92102	-2.64008	-3.20425	-3.01434	-2.43579	-1.11658	-1.11658
1903	7	-0.655365	-0.39099	-3.16492	-1.60721	-2.62003	-3.7399	-3.7399
1903	8	-3.89487	0.263702	-2.56674	2.59918	-2.19543	-2.86523	-2.86523
1903	9	-3.72467	-1.46936	-0.72095	1.29739	-1.68201	-0.27933	-0.27933
1903	10	0.85791	-0.95105	-2.73111	0.566772	0.547058	0.988831	0.988831
1903	11	-2.79922	-2.15207	0.744293	0.653992	-3.63187	-3.67044	-3.67044
1903	12	-1.94382	-1.4957	1.79715	0.566284	-4.90775	-1.64908	-1.64908
1904	1	1.92923	-1.25909	-9.30E-02	-1.84006	3.40234	-2.80661	-2.80661
1904	2	-0.657318	-1.89316	-4.61142	-4.20251	0.10199	5.86032	5.86032
1904	3	-1.15845	-1.71942	-3.52032	-6.31155	-0.62399	-3.68735	-3.68735

1904	4	2.7796	-4.38858	-2.58398	0.460327	-0.24744	0.717926	0.717926
1904	5	-0.429688	0.154816	-2.41565	-0.48166	-1.31049	0.371613	0.371613
1904	6	-0.218231	2.11551	-1.70148	2.48434	-0.38211	-2.16647	-2.16647
1904	7	2.73523	-1.80307	-2.05643	-0.73883	-1.35852	-0.60111	-0.60111
1904	8	1.61212	-2.9819	-3.11456	-3.52002	-2.48062	-1.72794	-1.72794
1904	9	0.552826	-3.56314	-3.47775	1.29919	-1.66211	-0.79282	-0.79282
1904	10	-1.64441	2.07294	-3.59048	-0.11142	1.41635	-0.56146	-0.56146
1904	11	-3.32614	4.04E-02	0.225616	-0.6947	1.53912	-0.89874	-0.89874
1904	12	-3.26013	-2.04037	2.24615	0.641174	-0.72903	-2.3707	-2.3707
1905	1	0.922241	-8.61899	-5.16327	2.04904	-2.83856	-2.47351	-2.47351
1905	2	-1.91351	-0.53967	-4.45511	-0.30402	0.637207	-2.72449	-2.72449
1905	3	-0.158539	0.394379	-3.14282	0.821045	1.33932	-0.13355	-0.13355
1905	4	-0.624695	-1.64529	-1.09048	-1.47925	-0.80356	1.03293	1.03293
1905	5	-1.2565	-0.4668	-1.28125	-0.86298	-1.14307	-1.00879	-1.00879
1905	6	-0.299927	-2.492	8.91E-02	-2.38074	-0.72308	-2.10526	-2.10526
1905	7	-2.78577	-0.76538	0.281372	-4.26663	-0.53412	-1.76392	-1.76392
1905	8	-2.56067	-1.94891	0.27774	0.907684	-2.54733	-1.75095	-1.75095
1905	9	-1.77817	7.45E-03	-3.46027	4.86581	-0.10782	-2.48514	-2.48514
1905	10	-3.33362	1.66116	1.18439	0.129669	0.987549	-1.80664	-1.80664
1905	11	-6.11E-02	2.05215	-0.26718	0.582397	0.599731	-0.42023	-0.42023
1905	12	8.61E-02	6.97E-02	-1.22797	-2.05481	4.60E-02	-0.16037	-0.16037
1906	1	3.16724	1.5415	0.122925	-2.09677	-0.17587	0.400177	0.400177
1906	2	-0.996918	-1.58047	-0.40311	-0.55252	0.515991	1.22131	1.22131
1906	3	-1.21115	0.782501	2.84946	0.57724	-0.92798	1.79263	1.79263
1906	4	-1.86728	3.68E-02	-0.7854	-3.74887	-1.13474	-0.46085	-0.46085
1906	5	-3.54858	-2.94049	-1.02533	-0.40836	-1.13458	-0.48029	-0.48029
1906	6	-2.04062	-1.01019	-1.62988	-0.48004	-0.25049	-0.53827	-0.53827
1906	7	0.496338	-5.73E-02	-0.87192	-1.49731	-1.35703	-1.0383	-1.0383
1906	8	-2.32E+00	-0.97952	-2.22595	-0.72983	2.09E-02	-0.44605	-0.44605
1906	9	0.402435	-1.31805	-2.47836	0.437714	-0.29022	0.569061	0.569061
1906	10	-1.48502	-1.14355	0.908813	-1.04453	-0.75235	0.247345	0.247345
1906	11	-2.28314	0.348755	-0.3602	0.7742	-1.14276	-0.30185	-0.30185
1906	12	-0.259613	6.12E-02	-1.00815	2.17847	-0.98184	-5.9296	-5.9296
1907	1	1.77292	-2.13269	-2.05725	-6.98236	2.72565	-3.7594	-3.7594
1907	2	-5.11E-02	0.497345	-1.39191	-2.01782	0.902588	1.5816	1.5816
1907	3	-3.06345	5.46E-02	-1.35675	-0.30045	-1.87708	-0.45834	-0.45834
1907	4	-0.316101	-2.38928	-3.0007	-3.26016	0.888062	2.92575	2.92575
1907	5	0.839203	0.703705	-0.49454	-1.65897	-1.07657	1.74969	1.74969
1907	6	-2.06323	0.81662	-1.79095	0.624664	-1.6579	0.372925	0.372925
1907	7	-0.807159	-2.08948	1.43997	0.914764	-1.74911	-0.8472	-0.8472
1907	8	-1.61948	4.63E-02	-1.48746	-4.17422	2.24527	-0.51364	-0.51364
1907	9	-1.77579	1.85623	-2.99585	-1.5694	1.8772	0.843658	0.843658
1907	10	-2.58911	0.65564	-1.66919	0.629272	2.50858	-1.13315	-1.13315
1907	11	-0.818115	1.22305	-3.0799	-0.22681	2.93323	-3.66553	-3.66553
1907	12	0.748962	-6.80E-02	-5.78644	3.59E-02	-1.23575	-4.4733	-4.4733
1908	1	-1.05768	1.24011	-3.75925	-2.46097	0.345337	-3.3158	-3.3158
1908	2	2.28186	0.840149	-7.27673	4.27658	2.75479	-3.0636	-3.0636

1908	3	6.75E-01	-1.06693	-1.82083	-0.50995	2.50E-03	-4.78076	-4.78076
1908	4	-0.45108	-2.50909	-0.4274	-1.51926	-0.62924	-1.93967	-1.93967
1908	5	1.54312	-2.1828	-2.47043	-1.61398	-2.03146	-1.29419	-1.29419
1908	6	-1.07831	-2.57718	-1.02078	-0.66364	-2.46188	1.63803	1.63803
1908	7	1.30695	-2.76508	-0.53302	-2.19763	-2.49191	-2.04041	-2.04041
1908	8	0.555634	-0.43692	-0.30664	-3.06122	-3.27371	-0.27582	-0.27582
1908	9	-3.14166	-3.47726	-3.93124	1.07971	-1.10852	-0.76462	-0.76462
1908	10	-4.39252	-1.81064	3.11139	0.226471	1.86255	-1.64505	-1.64505
1908	11	-8.79E-01	-0.31155	-1.9527	-2.96231	-2.46E-02	0.361267	0.361267
1908	12	0.997375	1.01E-03	-4.28546	-1.10303	1.64145	0.842926	0.842926
1909	1	-0.362457	-0.89728	-1.65527	-0.83395	3.76242	-4.6503	-4.6503
1909	2	1.84488	1.95035	-1.65802	-2.71371	4.75131	-2.19809	-2.19809
1909	3	4.07214	3.5365	5.28058	0.808136	-2.78598	1.36795	1.36795
1909	4	2.12582	1.37E-02	-0.44858	3.67673	0.414062	-1.03278	-1.03278
1909	5	-1.80978	1.29633	0.94986	-1.53638	-2.60107	-0.90659	-0.90659
1909	6	-0.825134	1.57901	-0.15738	-2.03033	-1.94409	0.115631	0.115631
1909	7	-1.88824	1.02661	-1.53714	-2.75452	-2.98822	-1.3519	-1.3519
1909	8	-2.18137	1.14468	-0.49655	-3.00092	-1.13821	-1.64792	-1.64792
1909	9	-1.48798	-0.31744	0.652252	-0.1217	-0.20612	-1.58783	-1.58783
1909	10	-3.4082	-0.66657	1.61139	-0.6907	-2.47043	-0.43524	-0.43524
1909	11	-1.10684	-2.47107	1.2258	-0.38702	-3.71146	1.75867	1.75867
1909	12	-1.72E-01	-3.42E-02	-2.52716	2.14859	-6.96E-02	3.69693	3.69693
1910	1	-2.15308	-3.6662	6.47263	-3.66785	0.843445	-3.61621	-3.61621
1910	2	-0.453918	-5.99E-02	-0.98181	-2.70242	-0.32871	-3.97E-02	-3.97E-02
1910	3	-1.26505	-3.67172	3.70667	-2.86746	2.1987	-3.44E-02	-3.44E-02
1910	4	2.4783	-0.5076	0.461212	-0.54807	2.88315	-3.27E-02	-3.27E-02
1910	5	0.493103	0.883698	8.11E-02	-1.18866	-0.20657	-2.07739	-2.07739
1910	6	0.862488	-1.8186	-0.52676	-0.81644	-1.32339	-1.74576	-1.74576
1910	7	-3.08716	-2.22159	1.14426	-0.25003	-2.50922	-0.3458	-0.3458
1910	8	-0.817688	-2.89291	0.205963	-2.18472	-1.64471	-0.10312	-0.10312
1910	9	1.83423	-4.20346	1.79895	2.56189	-2.03622	-3.67392	-3.67392
1910	10	0.329102	-0.32324	1.548	0.740692	-2.85065	0.15155	0.15155
1910	11	-2.98E+00	1.68E-02	-4.34189	-3.82092	6.74E-02	-1.54434	-1.54434
1910	12	0.726166	-1.492	1.56094	-4.26E-02	-2.55145	-0.25739	-0.25739
1911	1	-4.70486	-0.4762	0.584229	-3.18576	0.646332	1.81979	1.81979
1911	2	-0.100311	-4.48755	2.88739	-3.30142	0.876495	-0.2847	-0.2847
1911	3	-0.561554	-2.33823	0.59967	3.14E-02	-0.29068	4.83E-02	4.83E-02
1911	4	-3.54358	-2.05969	2.82272	-2.20007	1.38367	-4.31705	-4.31705
1911	5	-1.16E+00	-0.42139	1.36197	-1.18365	-1.18E-02	1.1976	1.1976
1911	6	-1.80841	3.15231	-1.75156	-0.39624	-2.4451	0.984436	0.984436
1911	7	0.539154	-1.25717	-0.66522	-4.16122	-2.33591	-3.28482	-3.28482
1911	8	-1.53818	-0.22162	-1.56485	-3.41193	-1.03372	-1.56882	-1.56882
1911	9	1.88391	5.71E-02	-7.93E-02	-0.6171	-0.93051	-3.27783	-3.27783
1911	10	-2.71469	-0.74677	-1.30679	1.36838	2.71057	-2.01004	-2.01004
1911	11	1.02917	-0.54645	-3.37628	-1.74292	-3.51385	-2.64145	-2.64145
1911	12	0.19986	0.906708	1.06915	1.90439	-1.90765	2.9725	2.9725
1912	1	2.99594	0.881104	1.60175	3.76355	-3.18558	0.589081	0.589081

1912	2	-1.50372	-0.79398	-6.22873	1.5336	0.654297	-4.61459	-4.61459
1912	3	-1.18005	-0.34152	8.04E-02	1.41953	0.169922	0.846252	0.846252
1912	4	-1.41E+00	-5.7735	0.921112	0.886536	4.64E-02	1.43903	1.43903
1912	5	-2.29129	2.298	-2.32303	-0.72037	1.22614	-0.48019	-0.48019
1912	6	-1.27832	-1.25	-2.49756	-1.16324	-1.96201	0.485535	0.485535
1912	7	-0.720856	-2.9491	2.39047	-4.24081	-1.931	-0.42041	-0.42041
1912	8	-4.35449	-0.99832	0.890656	-2.25153	-0.51953	-1.20615	-1.20615
1912	9	-1.30518	0.627258	-2.15195	0.955902	-1.1304	-3.06082	-3.06082
1912	10	-0.157715	-0.66675	-7.3967	1.89337	0.388672	-0.64475	-0.64475
1912	11	-1.12473	1.53986	-1.02301	-4.77762	-0.78806	-4.40665	-4.40665
1912	12	-5.44724	0.196899	-2.29565	-1.60132	-4.64844	-4.70337	-4.70337
1913	1	1.92792	-5.00E-02	2.25693	-4.60175	-0.76117	7.28E-02	7.28E-02
1913	2	0.14978	-4.43497	-3.71542	-6.39932	-1.85541	1.19812	1.19812
1913	3	-1.47974	-1.77612	1.08588	-6.89526	-2.68689	1.02844	1.02844
1913	4	-0.298798	0.862701	-2.6152	-4.69516	-1.29855	6.41E-04	6.41E-04
1913	5	-1.66809	-5.2543	1.01517	0.221344	-1.25076	-3.38599	-3.38599
1913	6	-1.93573	-1.34518	-1.33447	-0.97144	-1.034	-0.11987	-0.11987
1913	7	-3.56967	-2.71909	-0.64203	-2.20151	-2.13611	4.85E-02	4.85E-02
1913	8	-4.13547	0.632904	-1.09515	1.63629	-0.95703	-1.31464	-1.31464
1913	9	-4.01627	-3.30536	-3.39084	-2.17581	-1.82703	-3.59314	-3.59314
1913	10	-1.28189	-1.88626	-0.79971	-1.73853	-2.53503	-0.91635	-0.91635
1913	11	-3.25403	-2.01425	1.66962	-0.29141	-0.14578	0.511169	0.511169
1913	12	0.376587	1.17712	-6.70706	-2.99622	-0.83023	-2.83737	-2.83737
1914	1	-2.40427	-1.95609	-1.46896	4.72446	-2.77927	-2.97241	-2.97241
1914	2	0.57666	-0.45105	-0.95041	2.28458	0.412506	2.08301	2.08301
1914	3	-0.819763	-2.89072	-6.08453	-1.40805	0.7005	3.25894	3.25894
1914	4	1.48471	0.913818	-4.95139	-2.58255	-0.33054	0.943451	0.943451
1914	5	-1.77069	-0.28479	0.396851	-3.60876	-2.92068	0.772614	0.772614
1914	6	0.331665	-2.56848	-0.37277	-3.20975	-0.74109	-2.64676	-2.64676
1914	7	-0.68457	-3.90457	2.46616	-1.59732	1.345	-3.30032	-3.30032
1914	8	-3.37778	-1.0043	-0.40314	-1.08392	1.53928	-0.74335	-0.74335
1914	9	-1.54376	-4.54056	-2.25146	2.0033	1.54559	-1.98193	-1.98193
1914	10	-2.87E+00	0.364563	-4.13129	-2.14923	-5.45E-02	-4.79407	-4.79407
1914	11	-2.64374	1.68585	-0.90329	-0.18512	-1.77737	0.274872	0.274872
1914	12	3.55759	-1.7283	1.20926	-0.91101	-10.0357	-0.55518	-0.55518
1915	1	-1.80658	-0.9838	-2.46085	-2.77026	-1.70087	-1.23312	-1.23312
1915	2	-3.29303	2.79865	1.26688	-4.728	-3.5618	-1.71909	-1.71909
1915	3	-3.96906	1.2384	-1.03174	1.56705	0.194611	-1.72174	-1.72174
1915	4	-0.571991	1.75403	-3.741	-0.53928	-2.16394	-2.83307	-2.83307
1915	5	0.744598	-0.69998	-0.30634	-1.95508	-0.89056	-1.87799	-1.87799
1915	6	-2.94913	-1.0452	-0.65918	2.35254	-0.8114	-2.91718	-2.91718
1915	7	-1.93387	-0.6055	-1.56052	0.742279	-0.7724	-1.3613	-1.3613
1915	8	-1.38007	-2.43121	-1.32654	-0.68601	-2.56644	-0.17273	-0.17273
1915	9	-1.91187	-3.43414	-3.84225	1.43469	-1.44043	-2.92773	-2.92773
1915	10	0.877502	-2.96564	-2.98941	-0.86502	1.02917	-0.31094	-0.31094
1915	11	-7.16E-02	-1.26254	-0.90619	0.475983	-1.70517	2.81E-02	2.81E-02
1915	12	3.29047	-1.59848	-0.14185	0.764862	-2.98764	1.97302	1.97302

1916	1	0.655121	-0.78	2.28845	1.17615	-3.55136	3.59088	3.59088
1916	2	1.55737	-1.99847	2.31827	2.84488	1.66159	0.833008	0.833008
1916	3	-3.14255	-2.1673	3.60385	1.42523	1.71741	0.565948	0.565948
1916	4	-2.31808	-1.55917	-0.31119	1.10284	-0.85983	-0.16916	-0.16916
1916	5	-0.985901	-2.70599	-0.60703	9.70E-02	-2.24527	0.737396	0.737396
1916	6	-1.19653	2.23041	-1.77548	-3.33426	-0.28339	-2.50757	-2.50757
1916	7	-1.56766	-1.1319	-0.77194	0.182465	-0.815	-2.7605	-2.7605
1916	8	-1.34027	-3.84531	-1.68845	-1.66962	-0.62894	-0.81802	-0.81802
1916	9	-2.04358	-0.70596	-2.21945	0.938599	-0.69431	4.40E-02	4.40E-02
1916	10	-0.62262	-1.34546	3.1554	-3.10941	2.21448	-1.92776	-1.92776
1916	11	-0.744141	-1.19476	-2.63849	-0.8544	0.854034	0.244049	0.244049
1916	12	1.47638	2.27872	-5.94E-02	-2.08731	-2.08475	-0.9379	-0.9379
1917	1	-1.21417	-0.4642	-2.91846	-4.57684	3.60022	1.18488	1.18488
1917	2	2.88489	3.14584	-3.33771	3.31198	3.53812	3.1264	3.1264
1917	3	-2.86E+00	6.22E-02	-0.32852	-4.95367	2.18E-02	0.572632	0.572632
1917	4	-0.72879	-9.80E-02	0.791595	-4.59976	0.343262	-5.73065	-5.73065
1917	5	2.22742	3.71402	-2.15735	-0.83728	-2.14877	-2.93729	-2.93729
1917	6	1.99677	0.213501	-0.42398	-4.14E-02	0.634705	-3.43985	-3.43985
1917	7	0.294342	-1.65918	-0.52783	1.65067	-0.4068	-1.40112	-1.40112
1917	8	-1.30908	0.509186	-1.94495	0.99649	-1.99612	-2.75674	-2.75674
1917	9	-2.89056	-1.99545	-3.71466	-2.86911	-2.4259	-1.36993	-1.36993
1917	10	-1.2392	-3.66904	1.21771	-1.52991	-0.83353	3.03E-02	3.03E-02
1917	11	-0.28653	-0.61585	0.951416	3.1225	0.997437	1.66736	1.66736
1917	12	-3.17563	-0.8537	-0.45557	-5.44623	-2.68555	2.96442	2.96442
1918	1	-4.87546	-0.49298	-0.48105	-1.00516	0.245544	-3.14752	-3.14752
1918	2	-0.826538	-1.99835	-0.65161	-4.5961	-2.67249	0.799805	0.799805
1918	3	-4.42E-01	1.78	-1.99472	3.59143	-7.77E-02	-0.18927	-0.18927
1918	4	-1.97519	-1.03568	0.661896	-8.41E-02	1.09494	-5.38E-02	-5.38E-02
1918	5	-1.07669	-0.33139	-0.36664	0.69812	-1.11337	-0.2627	-0.2627
1918	6	-1.71283	-0.1409	-1.52927	0.708252	-2.6795	-2.71527	-2.71527
1918	7	-3.28427	1.13303	-1.53E-02	-1.62622	-0.27322	-2.48471	-2.48471
1918	8	-0.772278	0	-0.71274	0.81839	1.60037	-2.16553	-2.16553
1918	9	-6.41928	0.181549	-4.54047	2.0459	0.9599	-1.15024	-1.15024
1918	10	-2.74271	-0.80814	-0.7945	-2.44522	-2.69745	-1.28925	-1.28925
1918	11	-0.572937	-1.82465	0.344604	-2.21503	0.276245	-0.12833	-0.12833
1918	12	-1.51733	-1.8941	0.511444	1.66876	-0.54303	-0.66977	-0.66977
1919	1	0.87262	-3.4859	1.54535	5.55225	-4.38367	2.05389	2.05389
1919	2	-0.621338	-1.42618	-4.61743	-2.17401	-0.96881	-1.5538	-1.5538
1919	3	-1.27164	0.810577	-0.77203	-2.25955	-3.16449	1.54715	1.54715
1919	4	9.04E-02	-1.84509	4.677	1.19025	-1.37305	-0.25186	-0.25186
1919	5	-0.125183	2.48581	-0.29135	-1.86218	-3.55188	-0.4566	-0.4566
1919	6	-3.57162	2.33792	-0.66376	-0.94254	-1.12091	0.360352	0.360352
1919	7	-3.52487	1.00763	1.18408	1.64679	0.139282	-1.12201	-1.12201
1919	8	-2.71158	-2.71E-02	-3.01736	-1.12073	0.128265	0.80246	0.80246
1919	9	0.399719	-2.78314	-2.38266	-0.5462	0.250977	-3.34854	-3.34854
1919	10	-0.261597	-1.08466	-1.58499	-2.32812	-0.42114	-2.51605	-2.51605
1919	11	1.32E+00	-0.41547	-1.9054	0.744598	1.83E-02	1.33356	1.33356

1919	12	1.79376	-0.4278	-4.99466	-1.38364	1.47595	-0.4708	-0.4708
1920	1	-1.07126	1.66562	-0.38266	-4.70685	-2.91006	-3.13522	-3.13522
1920	2	-5.15E-02	-1.33246	4.78909	-7.1199	-3.39871	-1.75369	-1.75369
1920	3	1.62064	-1.43741	0.579071	1.60513	-0.9133	0.667633	0.667633
1920	4	0.458618	-0.44928	-3.55408	-0.72955	-1.42496	-0.84076	-0.84076
1920	5	-1.36029	-6.22E-02	-0.71823	-1.85626	-1.06808	-1.80429	-1.80429
1920	6	-0.897522	1.26291	-0.64328	-1.83725	-0.8324	-0.23508	-0.23508
1920	7	-2.78235	-0.13467	-0.12463	-1.15244	0.677795	-1.66891	-1.66891
1920	8	-1.73227	0.135193	-0.49634	1.40628	-0.35623	-2.02823	-2.02823
1920	9	-2.22049	-0.61105	2.66516	-0.58139	-0.91211	-2.84824	-2.84824
1920	10	-4.11819	-3.43704	1.7886	-2.79773	2.58517	-1.91824	-1.91824
1920	11	-3.13242	2.94196	-1.40619	2.01569	-0.35745	1.97458	1.97458
1920	12	0.615662	-3.194	1.58026	-2.08472	-0.58756	2.45093	2.45093
1921	1	-2.56E-03	-0.96939	1.84573	0.159851	-3.66486	-1.95432	-1.95432
1921	2	-7.84503	-2.10007	-1.55151	2.46558	0.72641	0.910309	0.910309
1921	3	-0.128754	-0.57163	4.47E-02	0.899445	-0.31879	-2.26184	-2.26184
1921	4	-0.717285	2.21521	-1.25638	-1.42575	-1.04895	-0.46335	-0.46335
1921	5	-1.15018	-0.54959	-0.46683	-3.11078	1.45013	-0.46549	-0.46549
1921	6	-1.12003	-0.13889	1.14923	-1.69595	-1.85818	-0.18915	-0.18915
1921	7	-3.03076	-3.51498	1.17017	-2.84122	-3.96472	-0.31851	-0.31851
1921	8	-0.674866	0.460602	-1.25586	-1.68991	-0.93231	-0.65723	-0.65723
1921	9	-4.29E-02	-2.79205	-1.96246	-2.79321	3.07437	-3.56894	-3.56894
1921	10	-1.724	-3.16074	-3.8345	1.85309	1.69467	-1.10794	-1.10794
1921	11	-2.62662	0.621643	-0.54428	-2.83032	1.88742	0.179474	0.179474
1921	12	2.45746	-1.1488	2.71936	2.87378	-6.63596	-2.24268	-2.24268
1922	1	3.72324	-7.25058	0.812225	-0.28876	-1.76837	-2.41013	-2.41013
1922	2	-2.72812	0.859924	-1.37631	-4.64999	-0.2374	-1.30118	-1.30118
1922	3	1.91E+00	0.69928	-2.95132	-2.43207	-6.80E-02	3.90894	3.90894
1922	4	-0.684906	-4.56E-02	-1.95258	0.25705	-0.65186	0.270325	0.270325
1922	5	-2.8786	-0.3508	-3.05725	-1.18097	-0.68857	-2.06641	-2.06641
1922	6	-1.12073	-1.02338	-0.73056	-3.27515	-0.41959	-1.98837	-1.98837
1922	7	1.67725	-0.61279	-0.22543	-2.16031	0.363892	-2.6283	-2.6283
1922	8	-2.44919	-2.23E-02	1.13834	-1.26901	-1.86533	-3.75833	-3.75833
1922	9	-2.20538	0.963531	1.35486	-0.69739	-2.01871	-0.76773	-0.76773
1922	10	-1.4906	-1.53006	-0.37579	-1.27991	-1.74014	1.74106	1.74106
1922	11	-1.67233	-2.38055	0.372314	-3.6427	-0.25195	1.53467	1.53467
1922	12	-0.606415	0.219299	-3.16684	-4.22E-02	-1.54834	2.76343	2.76343
1923	1	2.24713	1.9505	-1.06125	0.118347	-1.52496	1.81189	1.81189
1923	2	-0.25943	-4.47186	0.61557	2.79028	-2.58688	0.202026	0.202026
1923	3	1.10223	-0.909	-9.81E-02	0.71463	0.162201	-1.64404	-1.64404
1923	4	2.349	-0.60159	-2.8989	-3.21506	-0.36316	0.854828	0.854828
1923	5	-1.06268	0.183899	1.16397	-3.06638	-0.22327	-1.55231	-1.55231
1923	6	-1.34464	0.59021	0.307617	0.296753	-2.67169	-0.92737	-0.92737
1923	7	-2.30606	0.395416	2.81497	0.303986	-1.2135	-0.55512	-0.55512
1923	8	-1.98749	-2.4617	-1.20544	-1.17172	0.194061	-3.42752	-3.42752
1923	9	-4.71027	-1.66586	-1.54337	-1.5437	2.15567	-2.66742	-2.66742
1923	10	-2.9632	-4.31805	-1.14551	-1.45462	-1.38394	-1.90414	-1.90414

1923	11	1.24258	-1.62164	-3.0593	-3.18671	1.06314	-0.69232	-0.69232
1923	12	-0.225433	-0.85858	-5.13214	-2.78943	-5.15024	-2.4068	-2.4068
1924	1	0.232239	-1.00009	-4.44135	-2.14944	-7.13705	-2.76831	-2.76831
1924	2	0.326477	-1.26038	-0.82233	0.480591	-2.58499	-4.2103	-4.2103
1924	3	-0.515045	-0.9191	0.26416	1.51904	-1.16669	-3.16315	-3.16315
1924	4	-0.132782	-1.64288	-2.5737	-1.08286	1.67847	-2.01175	-2.01175
1924	5	-0.144989	-0.79749	-0.15784	-1.79297	-2.91476	-1.7182	-1.7182
1924	6	-2.31711	2.58401	-1.21118	-2.01755	-1.8905	-0.48206	-0.48206
1924	7	-2.22986	-1.80048	-0.50082	1.01358	-0.22443	-3.44141	-3.44141
1924	8	-2.06E+00	1.1265	-1.30817	-1.12091	9.03E-02	-1.72034	-1.72034
1924	9	0.471436	-2.27185	-1.51736	2.05209	-2.16141	-2.28873	-2.28873
1924	10	-1.1843	1.20764	-2.07581	-0.82541	-1.72244	-0.57056	-0.57056
1924	11	-0.990326	-0.86655	-3.87421	0.291473	-0.14996	-2.33115	-2.33115
1924	12	-0.415314	-1.4303	-0.98096	-2.36093	1.30936	2.20E-02	2.20E-02
1925	1	-5.78726	0.250519	-3.79218	2.41125	-2.69485	2.0527	2.0527
1925	2	-2.55713	-1.29227	-1.89981	3.2312	-1.69391	2.8967	2.8967
1925	3	-2.21524	1.35468	-3.21985	2.59555	0.129517	3.76614	3.76614
1925	4	1.0907	3.24872	5.90E-02	-0.76025	-0.39484	2.62375	2.62375
1925	5	-1.6423	-0.33478	-1.75662	-1.82617	-0.42236	-0.29569	-0.29569
1925	6	-1.76694	-1.22E-02	-1.02786	8.08E-02	-2.2637	-3.40225	-3.40225
1925	7	0.224457	0.970703	-2.07162	-2.13531	-0.2912	-0.9996	-0.9996
1925	8	-0.937073	1.53387	-2.47516	-2.06891	-1.24402	-2.37344	-2.37344
1925	9	-3.50159	1.87393	-2.89975	-3.89041	-2.01431	-2.16632	-2.16632
1925	10	-1.21701	-1.65295	-0.28989	-0.73203	-1.42105	-8.51E-02	-8.51E-02
1925	11	0.306061	-1.99844	4.5343	-1.47922	-0.32956	-4.56473	-4.56473
1925	12	-0.845825	-4.2319	-2.37897	-0.18793	1.11365	-3.19687	-3.19687
1926	1	-0.357269	-0.8941	4.28983	-0.30386	-1.15106	1.04819	1.04819
1926	2	-0.965424	-0.84216	-2.40262	-1.48941	-1.44769	2.85413	2.85413
1926	3	1.45224	2.39209	-2.13284	-0.82806	-2.3454	0.598938	0.598938
1926	4	0.916199	-1.84857	2.68762	-1.73907	-2.23303	0.99115	0.99115
1926	5	-0.146484	-8.70E-03	-2.36594	-1.53656	-0.93088	-0.36191	-0.36191
1926	6	-2.52542	-1.8591	1.33072	-0.29346	-1.66489	-1.56216	-1.56216
1926	7	0.282654	-1.81207	3.45108	0.475067	-0.40561	-0.1911	-0.1911
1926	8	-1.59988	-1.21402	1.08923	-1.19492	-0.89182	-2.22964	-2.22964
1926	9	-0.99707	8.36E-02	-3.09924	2.07E-02	-0.3428	1.27716	1.27716
1926	10	-2.14081	1.15854	-2.0535	-2.354	-1.88324	-1.82974	-1.82974
1926	11	-6.13E-03	1.45624	-0.38959	-4.5495	2.43964	-2.25302	-2.25302
1926	12	-4.60083	-1.0318	-1.75714	1.74747	0.671356	-0.73798	-0.73798
1927	1	1.19482	1.23401	-1.69577	2.23044	-1.81317	-0.5625	-0.5625
1927	2	-0.757324	1.75183	-1.70331	2.46878	0.796112	-3.64209	-3.64209
1927	3	2.69656	4.2825	5.45E-02	0.696533	-0.93439	1.33716	1.33716
1927	4	-0.985901	2.75891	-0.18778	1.77945	-0.63455	-0.33365	-0.33365
1927	5	-1.2132	-2.04889	-1.64523	1.60504	-1.71478	0.444519	0.444519
1927	6	-1.41681	-0.65198	0.199646	-0.85794	-0.78949	-3.03885	-3.03885
1927	7	0.10733	-1.81558	0.347168	0.140869	-1.5058	-1.00681	-1.00681
1927	8	1.02551	-2.81662	0.874634	-2.22083	0.505463	-1.52554	-1.52554
1927	9	-0.487183	-2.76324	-1.84476	-0.20081	-1.06931	1.52756	1.52756

1927	10	-0.867218	-1.81714	-0.49439	-1.61981	1.35126	1.36774	1.36774
1927	11	0.622162	-1.17E-02	-2.10141	0.647797	2.93033	-1.99155	-1.99155
1927	12	-3.59103	0.671814	2.56033	-5.95682	-3.31946	-3.33148	-3.33148
1928	1	-5.50476	-2.08939	4.38773	0.841858	-6.09897	3.30338	3.30338
1928	2	1.93927	2.16214	3.17667	0.806183	1.2258	-0.7952	-0.7952
1928	3	-5.00906	-0.7428	-0.70435	6.71973	-3.59219	3.68704	3.68704
1928	4	-1.3605	-0.8971	-1.45679	3.76825	-2.49814	-0.11667	-0.11667
1928	5	-0.804504	-4.21899	-4.18784	-1.32767	-0.23969	-2.14389	-2.14389
1928	6	-2.39493	2.92E-02	0.410645	1.92206	-1.99069	-2.49628	-2.49628
1928	7	-1.88205	0.784302	-2.52222	-1.48334	-0.98721	-1.59082	-1.59082
1928	8	-0.946686	0.398102	-3.39755	-1.08142	0.675385	-1.42844	-1.42844
1928	9	-1.19537	-1.70667	0.464355	2.92499	-1.3432	-3.09473	-3.09473
1928	10	-1.76471	7.06E-02	2.83359	-3.97821	1.77057	-2.48456	-2.48456
1928	11	-1.84E+00	-0.94577	-1.28299	-4.60641	8.73E-02	-3.72205	-3.72205
1928	12	-0.827515	-0.34299	-2.51944	-0.55252	-1.44556	-2.65E-02	-2.65E-02
1929	1	-2.46616	-5.02E-02	-1.69397	4.57733	-1.29608	-4.90891	-4.90891
1929	2	1.45847	-2.05905	-3.06262	4.29221	-5.13959	-0.12369	-0.12369
1929	3	-0.95816	1.64938	0.524963	-0.53317	-2.37579	-0.94174	-0.94174
1929	4	1.59741	-1.23169	-2.81277	0.644135	1.15524	-4.14645	-4.14645
1929	5	-1.70108	0.279022	-2.11203	1.33783	1.63171	-0.21909	-0.21909
1929	6	-3.16391	0.668823	0.369446	-2.20114	1.56299	-0.54996	-0.54996
1929	7	-4.67386	-1.33868	1.08667	0.533386	1.66779	0.170502	0.170502
1929	8	-2.00488	0.327179	0.568237	0.432678	-0.19162	-0.89114	-0.89114
1929	9	-1.73587	-1.74527	-1.13077	-1.19931	2.23709	-1.70212	-1.70212
1929	10	-1.48199	-1.48087	-5.8895	-1.41241	-2.67773	1.08383	1.08383
1929	11	-3.19174	0.307251	0.620514	-3.10571	1.09235	1.36615	1.36615
1929	12	-0.718719	-2.29279	-1.15936	-2.80573	-0.43683	0.600403	0.600403
1930	1	-4.19067	5.56E-02	-4.46545	-4.21536	2.90652	4.8009	4.8009
1930	2	-1.85672	-10.274	-3.96E-02	-1.27652	6.2594	4.33871	4.33871
1930	3	-1.51694	-3.52402	-0.63855	4.44925	-0.57739	1.71533	1.71533
1930	4	-1.1474	-2.76028	-0.9386	1.89703	-1.47614	-0.61816	-0.61816
1930	5	0.654602	0.146606	0.151276	-0.97257	1.77472	-0.19861	-0.19861
1930	6	-1.79321	-0.90079	-1.05026	-1.87204	1.8298	-0.71198	-0.71198
1930	7	-1.65036	-3.3165	-0.81543	0.452087	2.05008	-1.98E-02	-1.98E-02
1930	8	0.917419	0.748383	-0.66715	-3.85193	-2.06052	-0.47095	-0.47095
1930	9	-2.44028	-0.49875	-9.34E-03	2.3414	-0.12891	-2.82684	-2.82684
1930	10	-0.551697	-2.56036	-1.09909	1.29108	-1.58435	0.81543	0.81543
1930	11	2.02039	0.907257	-3.7099	1.04617	-0.44748	-1.77722	-1.77722
1930	12	1.22656	0.766602	-5.24994	-2.80301	-5.08826	1.4884	1.4884
1931	1	2.52432	1.13522	0.932434	-9.11586	-2.44827	-1.9021	-1.9021
1931	2	2.43729	-0.38385	0.354767	-8.2883	2.0159	1.86542	1.86542
1931	3	-8.44E-01	2.3223	-1.34622	-7.67755	-8.30E-03	-2.79056	-2.79056
1931	4	-6.75E-02	0.554626	-4.3847	0.490051	-0.88196	1.16623	1.16623
1931	5	-1.86728	1.5368	-1.30322	3.86954	-1.54129	0.671814	0.671814
1931	6	-2.42932	-1.27219	0.436035	1.46344	-0.85669	-0.61386	-0.61386
1931	7	1.27734	-2.8895	-1.93954	-1.93692	-1.01651	-2.12939	-2.12939
1931	8	1.19254	0.628876	-0.59045	3.0134	-1.67892	-2.06384	-2.06384

1931	9	8.33E-02	-0.37405	-1.63766	-1.31839	-0.83682	-2.28E-02	-2.28E-02
1931	10	0.630798	2.92996	0.483093	-1.7182	0.866272	1.15314	1.15314
1931	11	-1.30933	-7.05E-02	-1.45468	-1.51233	1.45493	-1.08853	-1.08853
1931	12	-1.54544	1.2428	-0.60614	1.70218	-1.51843	-5.18378	-5.18378
1932	1	2.97E+00	4.0307	-1.11255	-4.93124	-6.80E-02	-1.48782	-1.48782
1932	2	-2.59E-01	1.28903	-1.54813	1.7478	-8.63E-02	-1.3237	-1.3237
1932	3	-1.28574	-3.10461	-4.12164	0.877136	1.67822	-0.56604	-0.56604
1932	4	2.6499	1.00513	-3.0921	2.00885	-1.52313	-1.20297	-1.20297
1932	5	2.26062	1.3038	-0.87485	-0.92957	-0.30789	-1.73291	-1.73291
1932	6	-0.297607	-1.25369	-2.67438	-3.76135	-1.0123	-1.65005	-1.65005
1932	7	1.70123	0.799927	-1.44693	-2.78223	-1.84122	-2.81921	-2.81921
1932	8	-0.787292	-0.47443	-2.46994	-4.26102	-1.10544	-2.36484	-2.36484
1932	9	0.143829	-2.89835	-2.17847	-5.2883	-2.94913	0.67218	0.67218
1932	10	2.98E-02	1.28094	-1.54309	-2.99463	-1.84485	2.10745	2.10745
1932	11	0.415985	-3.54675	-0.21881	-1.69E-02	-1.91818	0.860657	0.860657
1932	12	-0.776917	-2.01138	-2.43E-02	8.52E-02	-3.33286	-6.2139	-6.2139
1933	1	0.493042	0.1604	-0.63065	-2.33246	-1.07968	-7.13651	-7.13651
1933	2	4.72406	3.14203	-4.86142	-3.32172	-2.2879	-7.21597	-7.21597
1933	3	2.28424	1.16119	-4.07355	0.818726	-0.71417	-1.74155	-1.74155
1933	4	2.02942	-0.95679	1.19461	-5.31396	-0.59546	-2.62265	-2.62265
1933	5	-0.882477	4.38562	1.55176	-3.47516	-1.65356	-1.4686	-1.4686
1933	6	-1.03842	1.263	-1.12708	1.27866	1.66031	-2.01257	-2.01257
1933	7	-1.53555	2.65961	0.656158	-1.44724	0.309601	-0.7132	-0.7132
1933	8	-1.59607	0.335693	-0.93405	1.6095	-1.14041	-0.71152	-0.71152
1933	9	-0.312988	-2.39615	1.63126	-0.2439	-1.79993	-1.67014	-1.67014
1933	10	-5.65E-02	-2.66946	2.51651	-6.60E-02	0.258148	1.49615	1.49615
1933	11	0.303558	1.55435	2.22049	-2.56021	1.37463	-0.23074	-0.23074
1933	12	0.801575	-2.2583	-1.23096	-5.43762	-0.37445	-3.91937	-3.91937
1934	1	-0.453552	8.59E-02	-0.29038	-0.31137	-0.88507	-0.4155	-0.4155
1934	2	-1.31921	-2.46338	3.99667	-4.74542	-0.1182	-3.17249	-3.17249
1934	3	0.472961	0.317078	-1.05484	-0.55325	1.8634	-1.58224	-1.58224
1934	4	-2.33E+00	1.51102	-2.59769	-0.27277	-2.18E-02	-2.16177	-2.16177
1934	5	-0.264801	0.996307	-2.29263	1.03674	0.286407	-2.57019	-2.57019
1934	6	-2.41E-02	-2.0061	6.59E-02	-4.96725	-0.86841	-1.58987	-1.58987
1934	7	-1.79865	-0.99197	-0.96402	-2.00552	3.25879	-0.21991	-0.21991
1934	8	-0.948578	0.578186	0.935944	-1.13843	1.31079	-1.03165	-1.03165
1934	9	-0.696472	1.51154	-0.57056	-2.05869	0.237579	-2.17822	-2.17822
1934	10	1.9859	-2.14145	-0.8667	-2.49661	0.86795	-2.30966	-2.30966
1934	11	-2.20773	-0.92407	-1.78079	-2.7153	0.222839	-2.25363	-2.25363
1934	12	-0.629913	-3.14868	2.49805	3.41177	-3.85583	-0.76547	-0.76547
1935	1	-2.57196	2.11771	8.30E-02	1.51114	2.74515	0.432098	0.432098
1935	2	8.88E-01	2.75595	-1.75363	1.77631	9.92E-02	0.757416	0.757416
1935	3	-1.10876	1.93179	-3.33353	2.96793	-0.547	0.148346	0.148346
1935	4	0.7341	1.49911	-2.76068	-1.11966	1.40137	-2.41046	-2.41046
1935	5	-2.65378	-0.43259	2.89056	0.207336	1.73651	1.1044	1.1044
1935	6	-0.983337	2.98462	-0.51987	-1.24066	0.723816	-0.75955	-0.75955
1935	7	-2.44E+00	-0.16248	1.66037	-0.98932	9.24E-02	-0.71051	-0.71051

1935	8	-1.79709	4.11749	2.14655	-2.02161	0.518463	-1.21E-02	-1.21E-02
1935	9	-0.986664	3.28406	-0.76666	0.748505	-3.30713	-3.80573	-3.80573
1935	10	0.719086	0.686646	3.09052	-0.30432	3.19366	0.187256	0.187256
1935	11	-0.884125	-3.59286	-0.98608	2.2923	1.09512	-3.04153	-3.04153
1935	12	-3.44241	0.361725	-3.54587	-7.10562	0.54126	-1.267	-1.267
1936	1	-2.63165	1.1788	-1.49326	0.968231	2.46872	2.12369	2.12369
1936	2	-1.92682	-1.90848	-5.48083	-2.22522	0.700989	-5.7269	-5.7269
1936	3	-1.46375	-2.03101	-5.08255	-4.00507	1.17383	-3.59396	-3.59396
1936	4	0.145721	-3.35248	-0.5015	1.09653	-1.61255	-2.26675	-2.26675
1936	5	1.35202	1.7536	-0.28333	0.944427	-1.24689	-1.04361	-1.04361
1936	6	-0.201416	2.55432	-0.92227	-0.35034	-0.96161	-2.92285	-2.92285
1936	7	-1.54385	-1.79538	-0.86383	-0.24173	-1.79431	-1.95132	-1.95132
1936	8	-1.62268	0.154175	-1.27234	-1.07452	-0.72562	-3.23074	-3.23074
1936	9	-0.621063	0.60025	1.19995	1.9357	-1.24432	-0.67163	-0.67163
1936	10	-0.543304	-0.58347	-1.43079	-3.46933	-0.48825	0.482758	0.482758
1936	11	-1.55573	-0.21707	-1.92621	-2.00861	-1.10626	-0.23892	-0.23892
1936	12	0.858978	0.291718	-7.37015	-1.97012	-0.78064	2.3085	2.3085
1937	1	-3.60E-02	-2.09509	-1.16135	-3.76746	-0.93878	-1.81952	-1.81952
1937	2	3.23697	-2.42636	-0.13803	-3.24911	-4.48929	1.46072	1.46072
1937	3	0.34906	7.68E-02	-1.15033	7.17E-02	-0.75189	-1.49277	-1.49277
1937	4	-0.683289	-1.67938	-2.75919	-3.42935	0.734039	-1.86575	-1.86575
1937	5	-2.6015	-0.23859	-0.17783	-0.37647	0.35611	-0.70569	-0.70569
1937	6	-2.37E-01	-0.1214	-2.02768	-9.48E-02	8.76E-02	0.308533	0.308533
1937	7	0.346954	-0.91959	-3.62634	-3.21753	0.318878	-2.5202	-2.5202
1937	8	-0.189178	-0.26071	-2.76706	-2.27103	-0.23102	-1.98993	-1.98993
1937	9	-2.50726	-0.93677	-3.39676	0.403015	-0.54172	-2.33392	-2.33392
1937	10	-0.998901	-1.60855	3.18E-02	-3.6033	0.923676	2.75284	2.75284
1937	11	-0.460541	0.985931	5.56E-02	-1.16101	-0.92746	-0.71433	-0.71433
1937	12	-0.260315	-3.73529	2.73E-02	-2.95001	-0.10236	-1.9115	-1.9115
1938	1	1.36313	1.2019	-3.79E-02	-1.28635	2.85645	-0.672	-0.672
1938	2	-4.15341	-0.46945	-4.10751	-3.82971	0.80191	7.5932	7.5932
1938	3	-0.932953	0.783691	-4.37143	-4.27725	1.42023	2.30505	2.30505
1938	4	-1.70529	0.660309	-4.85358	-0.33185	-0.31046	-4.12616	-4.12616
1938	5	-0.462585	0.197601	-0.88745	-0.27927	0.280731	-2.09579	-2.09579
1938	6	-1.05481	-5.99E-02	-0.26276	0.759857	1.9913	-3.59915	-3.59915
1938	7	0.259857	-0.46439	-1.23434	2.23688	0.136993	-1.83911	-1.83911
1938	8	1.31003	2.1344	-2.59714	1.8978	-1.34723	-1.87473	-1.87473
1938	9	-1.36359	-5.49E-04	-7.77E-02	-1.81589	2.8082	0.695557	0.695557
1938	10	0.253082	-2.86636	-1.7023	-4.11121	-1.18774	-0.71265	-0.71265
1938	11	-0.792725	-0.75555	-2.68179	-1.25223	1.02362	-1.49283	-1.49283
1938	12	2.03296	1.17001	1.99976	-0.22382	1.04434	-5.0795	-5.0795
1939	1	-8.11E-02	0.414917	-1.33655	5.62494	2.26743	0.707397	0.707397
1939	2	-2.80774	1.49225	1.59769	0.903076	2.59479	2.05341	2.05341
1939	3	-1.25616	-0.68182	-0.71335	2.99033	-0.45477	-7.19687	-7.19687
1939	4	1.88611	-2.12149	-0.6138	-4.09305	-0.19113	-0.90356	-0.90356
1939	5	0.112	-1.62448	-0.28635	-3.60165	-0.61578	-1.42288	-1.42288
1939	6	-2.11652	-0.60819	3.02774	-3.02066	0.376495	-2.55215	-2.55215

1939	7	6.55E-01	-2.88589	2.32687	-0.32993	7.01E-02	-3.51559	-3.51559
1939	8	-1.85419	-1.5849	-1.06E-02	0.701172	1.47559	-1.00604	-1.00604
1939	9	-1.03E+00	-0.52536	0.666962	-0.46539	5.37E-03	-1.71863	-1.71863
1939	10	0.449982	-0.80896	0.997589	-4.54663	-0.50082	-1.94846	-1.94846
1939	11	0.499969	-1.62726	0.200714	-3.60742	0.437927	2.07578	2.07578
1939	12	3.88828	-5.54648	-0.70984	-1.54242	-0.65845	0.745911	0.745911
1940	1	4.13452	-0.13129	-1.03137	-1.14017	2.15314	-1.12051	-1.12051
1940	2	0.294067	-2.34045	1.11996	-4.5968	-0.25961	4.9682	4.9682
1940	3	1.69034	0.546997	-0.29132	-3.24088	-0.82147	-1.84396	-1.84396
1940	4	2.95511	-3.37289	-2.74988	-0.77466	2.09674	0.855835	0.855835
1940	5	-0.923798	-3.26559	-3.32904	1.33673	0.145813	-0.12448	-0.12448
1940	6	1.42627	-0.40488	-1.86096	2.15396	2.4494	-2.51996	-2.51996
1940	7	-2.20E+00	-2.5376	-1.22513	2.48569	9.60E-02	-1.7399	-1.7399
1940	8	0.154907	-0.58691	0.511047	-0.43381	0.641083	-1.53592	-1.53592
1940	9	-1.72018	9.05E-02	-1.87067	0.131805	-0.58713	-2.58112	-2.58112
1940	10	-3.9119	-0.23315	1.20209	-3.08841	1.06766	-0.73465	-0.73465
1940	11	-1.93E+00	-0.55927	1.35132	-6.40E-02	8.33E-02	-1.95352	-1.95352
1940	12	-0.510742	-0.51578	-1.71066	7.63538	-4.66443	-1.77399	-1.77399
1941	1	-1.05756	3.27E-02	-4.23676	6.25156	-1.50876	-3.8999	-3.8999
1941	2	-0.505829	-5.82736	-1.53281	4.59299	-3.06949	0.497101	0.497101
1941	3	-2.12936	1.09338	-0.57733	1.51794	0.748901	-4.11044	-4.11044
1941	4	-1.99799	2.78412	-1.11768	-0.78976	-1.23065	-7.08E-02	-7.08E-02
1941	5	-2.05E-02	-0.14059	-3.82794	2.88782	-1.87369	-3.4986	-3.4986
1941	6	-3.76E+00	-3.09	-1.45108	2.52716	8.35E-02	-2.43466	-2.43466
1941	7	-3.71265	-2.14059	0.436371	-2.71512	-0.72232	-1.03372	-1.03372
1941	8	-2.63046	-4.18771	6.37E-02	2.42407	-1.06161	-2.70773	-2.70773
1941	9	-1.69577	-5.50397	1.73706	-1.7872	0.826874	-4.55023	-4.55023
1941	10	-1.74991	-2.63766	-0.49411	1.51819	-0.46695	1.26263	1.26263
1941	11	0.299866	-0.54196	0.240906	1.7746	-2.82446	0.474152	0.474152
1941	12	0.340179	-3.61368	1.71893	-3.57764	-1.81934	0.507812	0.507812
1942	1	5.41064	-2.31308	1.52835	6.00E-02	-2.83646	2.87738	2.87738
1942	2	4.41959	-2.80237	3.81E-02	-0.28012	-2.30219	-3.18588	-3.18588
1942	3	2.76175	8.58E-03	-1.54294	3.12595	0.409607	-4.64175	-4.64175
1942	4	1.7919	-1.83279	1.28201	0.378143	0.946167	-1.29807	-1.29807
1942	5	1.34952	-2.09439	-6.20E-02	-3.43097	0.52243	-1.28738	-1.28738
1942	6	0.505676	0.123016	1.05594	-1.76013	0.610107	-3.03168	-3.03168
1942	7	1.79346	1.22491	0.955963	-2.19263	3.07819	-0.8331	-0.8331
1942	8	1.35013	-0.25592	0.409546	-0.58221	1.45886	-1.66913	-1.66913
1942	9	2.83481	1.33215	-0.26355	0.88681	3.34927	-4.75323	-4.75323
1942	10	1.33798	-1.98834	1.9725	1.9249	3.00568	-4.38354	-4.38354
1942	11	-2.05524	-2.50916	0.915619	-3.13651	3.00522	2.16907	2.16907
1942	12	0.255463	-1.41129	-6.70917	-4.54431	2.13947	0.747925	0.747925
1943	1	-2.03418	-1.1611	1.04163	-0.88754	-1.98538	2.90469	2.90469
1943	2	-0.845612	0.528442	1.12109	4.16318	-3.1817	2.13821	2.13821
1943	3	-1.09296	-2.39243	1.24686	-0.40726	-2.78137	0.210754	0.210754
1943	4	-1.95929	-3.83807	-1.99359	1.68823	1.90247	-1.55286	-1.55286
1943	5	-0.375183	-2.60049	0.524567	0.303345	-1.69598	-1.8345	-1.8345

1943	6	-2.16962	-2.67508	1.04074	-1.36566	-0.20929	-0.81467	-0.81467
1943	7	-0.770172	-2.07147	0.641174	-0.81442	0.535095	1.6257	1.6257
1943	8	-1.09106	0.334076	-0.71475	-2.81342	-2.08472	-9.99E-02	-9.99E-02
1943	9	-2.00397	0.620239	2.62866	-1.0289	0.533875	-1.75232	-1.75232
1943	10	1.37E+00	-1.21677	-1.36661	-0.46112	-1.86E-02	-2.89355	-2.89355
1943	11	0.720581	-0.45065	-1.841	2.49658	0.396118	0.536469	0.536469
1943	12	3.93716	-1.23129	-3.12296	4.05469	3.24976	1.10992	1.10992
1944	1	-1.04376	1.44012	-4.53906	3.27515	-0.16525	0.600677	0.600677
1944	2	0.600677	-6.45078	2.41669	3.11368	5.1347	-1.28629	-1.28629
1944	3	-9.61E-01	-0.50562	4.26416	3.60925	3.62E-02	-4.46E-02	-4.46E-02
1944	4	-1.57709	0.360413	0.51181	4.20233	-0.41074	-2.85385	-2.85385
1944	5	-0.957886	1.9118	-2.91315	-0.83917	-1.59207	-0.82529	-0.82529
1944	6	-2.40051	0.709106	-1.21906	-3.19073	0.25531	0.757446	0.757446
1944	7	0.287354	1.18292	-1.32303	-2.91711	-0.81961	-1.18E-02	-1.18E-02
1944	8	0.967926	-2.81	-1.62314	-0.32681	-0.24823	-0.73062	-0.73062
1944	9	-0.152985	-2.29895	-0.84616	-1.4592	-1.3934	-3.40524	-3.40524
1944	10	-1.41852	-1.78986	-0.76331	-1.36722	-3.61224	-3.66525	-3.66525
1944	11	-3.93494	-2.65457	0.68689	1.24149	-0.44977	-1.82202	-1.82202
1944	12	-1.06104	-1.45309	-6.36E-02	-1.36722	-0.39136	-1.39108	-1.39108
1945	1	-5.69928	1.11942	-3.20026	-2.12305	-1.68628	3.90759	3.90759
1945	2	-1.16043	2.83734	4.89017	-6.8483	1.85519	1.68192	1.68192
1945	3	-3.76724	2.74838	3.40616	1.76385	-2.8367	2.87994	2.87994
1945	4	-1.3436	-0.2157	-0.38879	1.66034	-0.89453	0.974945	0.974945
1945	5	-0.195587	-1.2771	-1.63583	-0.47858	-0.81738	-1.91141	-1.91141
1945	6	-2.09503	1.65601	-1.57687	0.507843	2.29681	-1.34167	-1.34167
1945	7	-2.30206	0.301514	-0.57092	1.07617	1.14209	-2.45361	-2.45361
1945	8	-0.591064	1.56088	-0.13336	-4.91E-03	1.44586	-1.31503	-1.31503
1945	9	0.500336	3.17545	1.31265	2.0394	4.38449	-0.57153	-0.57153
1945	10	-0.619293	-1.68564	-0.7627	-0.44931	-1.11813	-0.65704	-0.65704
1945	11	-3.29312	-0.11404	2.75659	-0.82752	2.80304	-3.22772	-3.22772
1945	12	-0.769318	-1.90588	-0.29904	-2.87433	-0.71475	-6.44638	-6.44638
1946	1	-0.547058	-0.7854	1.73425	4.41434	-0.50586	1.19238	1.19238
1946	2	-7.25E-02	-2.47375	3.02307	-0.7113	1.6582	-3.1185	-3.1185
1946	3	-1.39764	-0.5318	2.02466	2.85483	-3.21429	-1.65295	-1.65295
1946	4	-0.674805	-2.05548	-0.90299	2.12335	-0.75723	-2.02405	-2.02405
1946	5	-1.3017	-1.06888	-2.09955	-1.12378	4.00543	-0.86411	-0.86411
1946	6	-2.23203	0.871704	3.76282	-2.90634	-0.35251	-1.33157	-1.33157
1946	7	-1.03656	-0.35977	0.842163	-4.97E-02	-1.4765	-1.80411	-1.80411
1946	8	1.55692	-1.32962	1.66446	-4.09332	0.190491	-0.14984	-0.14984
1946	9	-2.36996	-2.85135	0.741638	-2.1868	0.494171	-2.50632	-2.50632
1946	10	-2.56729	-4.68594	-1.67401	-2.03293	0.681854	-4.78564	-4.78564
1946	11	0.908661	-0.70645	-0.2186	0.784882	-0.18576	-2.10294	-2.10294
1946	12	1.39438	-4.17349	-1.58514	-4.26282	-1.23395	-4.41629	-4.41629
1947	1	-5.70346	-4.75909	-3.40076	-1.86435	3.32394	-1.53391	-1.53391
1947	2	0.140076	2.08633	1.54517	2.28238	-2.80899	-3.4068	-3.4068
1947	3	-1.09555	0.674896	5.25125	0.852844	1.9017	1.42804	1.42804
1947	4	0.420013	-2.86188	-1.56128	-0.73636	1.45627	0.376343	0.376343

1947	5	-2.19019	0.549103	1.03406	-2.31647	2.23123	-2.8364	-2.8364
1947	6	-1.17072	-0.27628	0.793732	-3.41275	0.558716	-2.41107	-2.41107
1947	7	1.24335	-0.16687	-0.74454	1.57169	1.36099	-3.18481	-3.18481
1947	8	-1.95016	-0.45371	1.73105	1.67429	0.388489	-1.06152	-1.06152
1947	9	0.225708	-5.83905	3.19073	-0.86209	2.02017	-2.76642	-2.76642
1947	10	0.377808	-1.60315	2.56189	0.56308	-1.21033	-9.46E-03	-9.46E-03
1947	11	1.37726	-0.76807	3.89011	-2.34332	-1.25375	1.80338	1.80338
1947	12	3.26898	-1.9389	-3.86975	3.49997	3.03375	-2.448	-2.448
1948	1	-2.16916	1.74442	2.15405	-2.27457	3.78433	-5.418	-5.418
1948	2	-2.30692	3.07443	1.49588	3.65891	1.3447	-7.9249	-7.9249
1948	3	0.863861	-2.01462	-2.74323	-5.18E-02	1.99792	-1.51245	-1.51245
1948	4	0.943207	1.20221	-0.61609	-1.01105	-1.40533	-2.19937	-2.19937
1948	5	2.02792	1.1781	-1.83682	-2.19467	0.902527	-2.04639	-2.04639
1948	6	0.343964	-3.03E-02	-2.43417	-1.40164	-0.14969	-2.28397	-2.28397
1948	7	-0.815369	-1.52808	-2.05414	-1.62714	2.18518	-2.77161	-2.77161
1948	8	0.757019	-1.4931	-2.00754	-2.08871	-0.87042	-3.47693	-3.47693
1948	9	-3.95529	-2.66327	-0.84665	-1.68051	-2.64322	-1.72781	-1.72781
1948	10	0.194885	-2.44525	-0.5079	-0.50351	0.259766	-4.57675	-4.57675
1948	11	-3.13E-01	-1.05615	-2.23648	-2.87262	-7.04E-02	-1.62354	-1.62354
1948	12	0.800964	-1.9039	2.18625	-3.31033	-2.83066	-8.24E-02	-8.24E-02
1949	1	-0.29776	-0.7196	-0.72687	-0.26065	-1.14438	1.78659	1.78659
1949	2	-2.41891	-0.97388	2.82248	2.70688	1.9436	-4.60358	-4.60358
1949	3	-2.12915	1.5647	0.518677	-0.32455	-0.96079	-0.51877	-0.51877
1949	4	-1.06058	1.70932	0.514404	0.562439	-0.38654	1.05804	1.05804
1949	5	0.128723	0.361908	-0.46603	0.940247	0.115509	0.520111	0.520111
1949	6	-1.95053	-0.53748	2.30322	1.12766	-2.84549	-2.56436	-2.56436
1949	7	3.01276	-3.5618	-2.02E-02	-3.12363	-0.513	-3.40482	-3.40482
1949	8	2.88593	-4.31583	0.110352	0.764893	-0.84134	-4.54852	-4.54852
1949	9	-1.05777	-1.23004	-3.47214	1.7261	1.77609	-2.99731	-2.99731
1949	10	0.690491	1.99426	0.431396	-1.02692	3.05545	-1.84607	-1.84607
1949	11	2.03726	-1.45306	1.67749	1.7623	-4.50348	1.63437	1.63437
1949	12	-2.56372	-2.95059	1.06143	-7.93604	2.94327	-2.26389	-2.26389
1950	1	1.54764	-0.62949	-3.16E-02	-0.34946	1.03403	5.03159	5.03159
1950	2	-1.49512	1.39172	2.76358	-2.7757	2.84891	3.16122	3.16122
1950	3	-4.14566	1.5296	6.95E-02	2.56845	-0.18909	0.424042	0.424042
1950	4	4.3558	-4.1391	-0.6687	-2.40536	-0.45535	0.980225	0.980225
1950	5	-0.529602	-2.78058	-0.66434	-0.91858	-1.20837	0.702301	0.702301
1950	6	-1.33551	-4.6423	-1.87677	-1.00934	-1.87009	-0.13596	-0.13596
1950	7	2.22635	-2.55368	-1.44733	1.50317	0.112091	-0.39011	-0.39011
1950	8	-0.841187	-1.57822	-0.99005	-1.98801	-1.49182	-4.58554	-4.58554
1950	9	-1.85336	-4.15884	-2.45065	-0.82501	0.109985	-2.68762	-2.68762
1950	10	-0.866913	-0.69855	-3.24869	-2.802	3.66455	3.13995	3.13995
1950	11	-1.71384	2.53275	-1.45129	-2.42731	-1.08148	2.03467	2.03467
1950	12	-1.60614	-2.50989	-4.50555	-1.03632	-3.45856	-0.8248	-0.8248
1951	1	2.12714	-1.8038	-0.47656	4.18076	-2.34335	-6.34E-02	-6.34E-02
1951	2	-1.58002	0.421539	-2.63113	-5.43E-02	0.397186	-3.60358	-3.60358
1951	3	-0.835052	-3.07141	0.700867	-1.83325	-1.8779	-2.76425	-2.76425

1951	4	-1.32269	0.960205	2.31171	0.690552	1.16147	0.925354	0.925354
1951	5	-0.340179	-1.97787	1.00867	1.26242	-0.61307	0.970001	0.970001
1951	6	-1.98422	0.295898	1.18353	-1.45413	0.409393	-0.80356	-0.80356
1951	7	-1.86945	-0.9021	2.11646	0.662872	1.3299	-1.03061	-1.03061
1951	8	-2.13406	-4.34583	2.58154	0.747375	-1.42303	-0.87634	-0.87634
1951	9	-2.10898	1.64993	0.618561	-0.4903	-0.49143	-2.28543	-2.28543
1951	10	-1.3804	-3.71497	1.979	1.32147	1.83725	-1.78955	-1.78955
1951	11	0.871185	2.62E-02	7.49E-02	-2.55771	0.409821	-5.07965	-5.07965
1951	12	-3.85822	-3.14099	0.613861	1.50839	-2.83273	-1.57938	-1.57938
1952	1	2.36765	1.72702	-2.45566	3.89923	-1.07397	-3.16882	-3.16882
1952	2	3.01736	3.42084	0.768188	-2.8992	1.70721	-2.5806	-2.5806
1952	3	-0.272949	0.1716	1.62225	0.105652	-1.61227	-2.55734	-2.55734
1952	4	0.243103	-2.24988	-0.3013	1.98724	1.09735	-2.34436	-2.34436
1952	5	1.57E-02	1.43622	-2.99185	0.64212	-1.66699	0.718506	0.718506
1952	6	-2.61182	-2.80038	-1.29675	-0.76505	-3.1694	-0.73306	-0.73306
1952	7	-0.932648	-1.52698	-2.92392	-0.88791	-0.88193	-0.6814	-0.6814
1952	8	-2.01489	-1.8978	-3.02505	-1.0079	-1.74933	-1.24554	-1.24554
1952	9	-3.04779	-0.47687	-3.76337	-3.4577	-1.93292	-0.48703	-0.48703
1952	10	-3.95959	-2.73196	-4.50269	7.64E-02	0.368866	2.31165	2.31165
1952	11	1.10587	1.00534	-2.66449	-2.81921	0.330231	-1.88565	-1.88565
1952	12	-2.58981	0.437317	-0.92804	0.150269	-2.96094	-0.56158	-0.56158
1953	1	-3.24615	-0.56751	-3.75235	1.84006	-0.81177	3.3927	3.3927
1953	2	2.39319	-9.53E-02	-5.05722	1.87589	-0.2486	-3.17899	-3.17899
1953	3	-0.912537	2.99048	0.30896	2.18542	-0.97827	-3.66696	-3.66696
1953	4	-1.18448	-0.52667	-2.06818	-1.29965	-3.92615	-1.91727	-1.91727
1953	5	-3.13708	1.12881	-0.24774	1.99374	-0.62537	-2.08411	-2.08411
1953	6	-2.98242	3.259	-1.97086	-4.01456	-1.04309	-0.86298	-0.86298
1953	7	-0.858063	0.409424	-2.09924	7.93E-02	-2.10172	-1.82391	-1.82391
1953	8	6.93E-03	-1.7207	-1.13504	2.06717	-1.96191	-0.30142	-0.30142
1953	9	0.207611	0.888855	-2.55664	2.77719	-1.8869	-3.32263	-3.32263
1953	10	-2.59E+00	-0.43335	-1.81448	6.90E-02	6.18E-02	-1.46036	-1.46036
1953	11	-0.285126	2.71274	-2.9913	-1.78302	1.27844	0.404968	0.404968
1953	12	-1.36563	1.24222	-0.51685	0.35199	-0.36905	-1.50409	-1.50409
1954	1	-5.10318	-3.43329	-1.56427	1.20755	-1.75787	4.58069	4.58069
1954	2	-1.24463	2.90894	2.52737	0.967804	-5.96481	0.788116	0.788116
1954	3	-1.06445	-3.99362	-1.59152	3.80475	-1.67059	-0.28946	-0.28946
1954	4	0.1604	1.15591	1.58142	0.583344	-1.49695	7.48E-02	7.48E-02
1954	5	-1.1683	-0.10129	-1.57895	1.05322	0.633118	0.26709	0.26709
1954	6	-1.36053	-2.03098	-2.05457	-3.75876	-0.40039	-0.28278	-0.28278
1954	7	1.08014	-1.66339	1.12228	-1.69144	1.41638	-1.8812	-1.8812
1954	8	-0.197388	-0.96252	-0.79114	2.1279	0.129272	-0.50964	-0.50964
1954	9	0.91452	-3.90567	-1.61295	-0.33261	-1.66702	-2.47052	-2.47052
1954	10	-1.40289	-1.68326	2.35071	-9.83E-02	1.24295	-3.19846	-3.19846
1954	11	-2.49274	-1.05576	1.12341	-1.9729	-1.52368	-0.65595	-0.65595
1954	12	-0.181519	0.28952	-1.29996	3.47519	-1.66473	-0.50787	-0.50787
1955	1	1.52783	-0.43311	2.20483	5.13293	3.37234	-6.37021	-6.37021
1955	2	-3.12573	0.542328	2.15637	-1.94421	2.44781	0.790222	0.790222

1955	3	-1.56305	-0.319	-1.15182	-0.53305	-0.698	-5.47025	-5.47025
1955	4	7.06E-01	3.09531	0.564117	-2.32306	-7.79E-02	1.23315	1.23315
1955	5	1.42831	-3.92297	-1.26724	-1.38046	0.651123	-1.74991	-1.74991
1955	6	-1.81271	-2.7756	2.13184	-0.93124	2.67941	-0.54715	-0.54715
1955	7	-1.22125	-1.66708	2.11688	-1.45041	2.793	-0.93942	-0.93942
1955	8	0.762512	2.0325	-0.59695	-1.48721	0.783569	-2.30045	-2.30045
1955	9	1.03613	1.20145	-0.44925	-1.06989	2.53549	0.967285	0.967285
1955	10	1.1601	-4.68E-02	1.2926	-1.29123	-1.14624	-1.93054	-1.93054
1955	11	-4.08243	-1.83615	0.706604	-1.85233	0.471039	-0.22583	-0.22583
1955	12	-3.69144	-1.14038	-1.04364	-0.69443	2.41284	-1.90039	-1.90039
1956	1	0.631531	-2.18048	-1.18295	-2.60574	0.378326	1.0116	1.0116
1956	2	3.33469	-2.54605	-1.35773	-4.3764	-3.88129	-0.3349	-0.3349
1956	3	4.50354	-0.23831	0.964172	0.710632	-2.15948	-2.61957	-2.61957
1956	4	2.32242	3.22E-02	1.9187	2.00903	-1.04095	-2.12585	-2.12585
1956	5	-0.101685	0.388519	0.679749	1.46735	1.37073	-1.22839	-1.22839
1956	6	1.51477	2.00241	-0.99616	0.753967	0.181488	-0.14948	-0.14948
1956	7	2.35843	0.927521	-0.69162	-0.67032	-1.68082	-1.31772	-1.31772
1956	8	0.854126	-1.8465	-9.22E-02	-0.67831	-0.91852	-0.54813	-0.54813
1956	9	0.434723	-1.80844	0.137634	-2.60791	0.424988	0.697784	0.697784
1956	10	1.10858	1.52155	-2.17621	0.605896	-0.69635	-2.12296	-2.12296
1956	11	-3.03802	0.846252	-0.1586	0.2854	-0.62997	-3.94684	-3.94684
1956	12	0.467987	1.87222	-3.70895	3.13647	1.68484	1.01343	1.01343
1957	1	-2.11606	-2.35678	-1.17795	-3.48145	2.30765	1.57489	1.57489
1957	2	-1.10123	1.84174	-2.38531	1.61908	3.6723	0.228516	0.228516
1957	3	-5.21E-01	0.917877	1.68695	-1.97287	-6.15E-02	-2.80707	-2.80707
1957	4	-0.448486	-0.9368	0.914825	0.878326	-0.40884	-0.63046	-0.63046
1957	5	-1.76489	1.6983	-2.83664	-3.00897	-0.24298	-2.8313	-2.8313
1957	6	-6.75E-01	-1.03748	1.11874	-1.31946	5.57E-02	2.25824	2.25824
1957	7	1.39563	-2.0654	0.791077	-1.06104	0.834076	-1.1189	-1.1189
1957	8	-1.04889	-4.35532	-0.13394	-1.98132	-2.22382	-3.38004	-3.38004
1957	9	0.220734	-0.46216	-0.88086	-0.69531	2.44418	-3.37793	-3.37793
1957	10	0.234894	-1.53516	1.02731	-0.79562	0.366577	-3.24835	-3.24835
1957	11	-0.339935	-2.41205	1.2439	4.16E-02	2.31174	0.444458	0.444458
1957	12	-0.341919	-0.6485	1.09555	1.32968	0.461945	0.434204	0.434204
1958	1	-0.834656	0.666809	4.69604	0.107941	-1.24048	1.64838	1.64838
1958	2	-2.38254	1.09143	6.16467	-0.93311	2.08649	3.98132	3.98132
1958	3	-2.56E+00	-7.98E-02	2.91986	-2.72577	9.70E-02	-2.22507	-2.22507
1958	4	-1.78E+00	-0.52557	0.292023	1.65213	7.14E-02	-2.68747	-2.68747
1958	5	-1.0589	0.66452	0.469269	0.307739	1.68613	0.198792	0.198792
1958	6	-1.48782	-0.76999	1.39655	-1.55994	-0.29269	-1.35956	-1.35956
1958	7	-0.155945	2.05423	1.97278	8.73E-02	1.1207	-1.7739	-1.7739
1958	8	-1.45099	-0.9115	-0.17246	-1.9765	1.13849	-2.80634	-2.80634
1958	9	-1.96667	-4.09497	-0.76157	0.879089	-1.93613	-1.57764	-1.57764
1958	10	-1.48251	-4.31464	-1.63739	1.47668	-0.92242	-0.79935	-0.79935
1958	11	-0.701416	2.43475	2.50562	-1.04361	-4.03198	-2.01093	-2.01093
1958	12	1.04877	0.919922	1.19345	-0.41971	0.65155	-2.58908	-2.58908
1959	1	-0.83078	-2.10089	-1.68585	6.45135	-4.44507	-0.23962	-0.23962

1959	2	-1.72803	-0.11826	-0.66553	-2.65561	-0.73401	-9.98828	-9.98828
1959	3	1.51004	-0.75882	-1.29373	-0.12436	-2.54648	-1.39447	-1.39447
1959	4	-0.740295	0.242004	-5.6051	1.93985	-1.27716	-0.65146	-0.65146
1959	5	-2.20038	3.22992	-2.50354	-1.14847	-1.46317	-2.57401	-2.57401
1959	6	0.994385	-2.138	-1.59418	-0.33295	0.170898	-1.23166	-1.23166
1959	7	-2.96057	-3.38217	-3.12842	-3.13342	-0.49973	-2.991	-2.991
1959	8	-3.52118	-1.62961	-2.32434	-3.73621	-0.50772	-2.51483	-2.51483
1959	9	-1.40607	-7.48904	-1.76764	-1.4202	1.45758	-1.44412	-1.44412
1959	10	-1.80811	-4.48315	9.26E-02	-9.83E-02	-0.33682	0.769653	0.769653
1959	11	-7.62E-02	-2.73087	1.6507	2.34628	1.18234	-2.31073	-2.31073
1959	12	1.80716	-3.09778	-0.45325	0.155487	-2.68243	-2.85568	-2.85568
1960	1	-5.74576	-1.14319	0.170837	1.38574	-10.5847	2.64209	2.64209
1960	2	-4.03E+00	0.201233	-2.55411	1.90399	-3.49E-02	1.51453	1.51453
1960	3	-0.846161	-2.85342	-0.17773	0.41394	-0.12848	2.46445	2.46445
1960	4	5.06442	-2.70297	-2.20938	-2.37997	-0.13324	1.30014	1.30014
1960	5	-1.22598	-3.4299	-0.88794	-1.32367	1.11774	1.759	1.759
1960	6	-7.68E-02	0.930298	5.04E-03	-0.67276	1.1947	-2.36127	-2.36127
1960	7	4.47E-02	-3.31659	-0.65552	0.106781	-0.18793	0.362396	0.362396
1960	8	-0.906891	-1.14893	1.97525	-3.52463	0.989166	-0.41922	-0.41922
1960	9	-3.67197	-1.23636	3.14575	0.159302	1.35797	0.274384	0.274384
1960	10	-3.38409	1.71246	-0.14819	2.24408	-2.39743	-4.51456	-4.51456
1960	11	-0.899414	3.56586	0.347412	-3.8692	1.59192	1.79108	1.79108
1960	12	1.98969	1.43762	-0.80167	-1.70691	3.07574	1.9808	1.9808
1961	1	5.47504	-8.76199	-3.89697	-10.0005	-1.31686	-5.05E-02	-5.05E-02
1961	2	2.52258	0.395325	-2.10223	1.7493	2.96069	0.938904	0.938904
1961	3	-1.21036	2.92938	3.62866	1.98563	-3.0618	-2.01575	-2.01575
1961	4	-0.630005	0.384705	-5.14999	1.48944	-1.30606	0.707336	0.707336
1961	5	-0.931885	-2.07449	-1.14914	1.31424	0.849609	-1.74728	-1.74728
1961	6	0.259064	-0.664	-0.12308	-1.98303	1.4393	-2.94415	-2.94415
1961	7	1.94595	-3.41608	-0.69583	1.86728	-0.125	-2.06152	-2.06152
1961	8	-1.99539	-1.41632	-2.59775	-3.20901	-2.21411	-2.52634	-2.52634
1961	9	-1.31796	0.201843	1.86734	0.611816	1.29077	-3.89581	-3.89581
1961	10	-1.83182	-4.08844	-2.0553	6.43E-02	1.17065	-3.86487	-3.86487
1961	11	0.715576	-1.91296	-1.59158	-3.0621	-2.07986	0.100769	0.100769
1961	12	0.316772	0.232025	-3.53986	-5.78561	-0.34924	-0.66919	-0.66919
1962	1	4.64893	3.24811	-4.08957	0.695435	-0.44186	0.262878	0.262878
1962	2	1.27377	-3.02686	1.79977	-4.7052	-0.37561	-5.13937	-5.13937
1962	3	-8.86E-02	0.533997	1.89505	-1.77695	1.1333	-7.25146	-7.25146
1962	4	-0.429291	-1.98187	0.195099	0.717834	-0.47934	0.517639	0.517639
1962	5	-1.55228	-0.57718	-2.65634	2.35782	1.31073	-2.01239	-2.01239
1962	6	-1.20233	-3.75098	-1.24377	-5.26996	-0.26819	-1.21097	-1.21097
1962	7	2.09415	0.715729	-2.28864	1.13818	0.435394	-2.99442	-2.99442
1962	8	-0.556488	1.48019	-4.88947	0.235596	-0.55423	-0.52554	-0.52554
1962	9	-0.900787	-3.79034	-2.49686	-3.34579	1.0943	-1.16891	-1.16891
1962	10	-1.46152	-0.63806	-1.24789	-3.51282	1.29108	-1.78674	-1.78674
1962	11	1.31567	-1.22726	-4.1427	-0.99472	-0.97916	3.14117	3.14117
1962	12	-1.72803	-2.66809	-1.07364	-0.62012	-3.95035	-3.59119	-3.59119

1963	1	-1.08118	-1.6366	-0.47726	-1.16776	-6.76996	0.692078	0.692078
1963	2	-3.32043	1.49454	-2.50012	1.10718	-1.46881	-2.31567	-2.31567
1963	3	-1.15314	-1.28192	2.55408	1.81354	-0.12088	0.636139	0.636139
1963	4	-2.94E-02	-2.91388	1.06802	1.69205	-5.22E-02	-1.21796	-1.21796
1963	5	-3.83179	-2.60599	-4.18E-02	1.71283	1.21823	-2.4502	-2.4502
1963	6	0.247986	-4.32788	0.936127	3.32355	0.393097	1.14685	1.14685
1963	7	-1.79E+00	-1.45148	-0.27124	-1.60764	9.58E-02	-2.1803	-2.1803
1963	8	-2.26938	0.351288	-1.16586	-2.3045	-0.58933	-0.51193	-0.51193
1963	9	-0.809265	-2.49576	-0.57016	0.921692	-0.55261	-3.53552	-3.53552
1963	10	2.06549	-1.56674	1.319	0.612976	1.99875	-1.93826	-1.93826
1963	11	-0.506622	-0.10675	-2.68311	-0.9021	-2.01315	-0.64294	-0.64294
1963	12	9.73E-02	-1.60608	0.794952	-4.03061	-0.51566	-0.4527	-0.4527
1964	1	-0.173065	-0.79788	2.85175	2.03986	1.88135	2.76398	2.76398
1964	2	9.18E-01	0.474121	0.506195	7.27E-02	-1.28E-02	2.95322	2.95322
1964	3	0.837463	-2.84012	0.217377	1.88263	0.209717	-1.58347	-1.58347
1964	4	-0.933502	0.897919	-4.64798	0.131653	-0.87564	-3.44116	-3.44116
1964	5	-5.11349	-2.92838	2.05057	0.797546	-0.89838	-2.74838	-2.74838
1964	6	1.19687	0.843597	-1.14578	-4.35754	-1.6781	-1.66647	-1.66647
1964	7	-2.60565	-2.22809	-1.50244	-1.90143	-2.8056	-2.09561	-2.09561
1964	8	-2.53549	0.8992	-2.63297	-1.31351	-3.52151	-1.53912	-1.53912
1964	9	-0.691467	-0.69745	-2.21185	-1.50989	-1.19781	-4.24683	-4.24683
1964	10	-1.04501	-1.97574	0.499603	-2.73282	-0.83875	-5.17786	-5.17786
1964	11	-2.19482	-2.71536	0.190491	-2.0874	-0.34488	-3.75613	-3.75613
1964	12	0.182861	1.3624	-0.16675	-3.55771	-0.93744	-5.91687	-5.91687
1965	1	-3.74905	-2.7164	3.62253	-1.44037	1.61945	-3.71802	-3.71802
1965	2	1.10458	-2.77997	-2.09561	1.04419	1.52371	-1.11798	-1.11798
1965	3	-1.09885	0.472473	-3.04443	1.18335	2.00043	-1.69806	-1.69806
1965	4	-0.365082	-0.11948	-1.70239	-1.57117	0.714142	0.160553	0.160553
1965	5	-1.87268	-0.76437	1.20737	4.06082	0.588715	1.388	1.388
1965	6	-3.02634	-2.72778	-2.95728	-1.18353	-0.71689	-1.92136	-1.92136
1965	7	-4.27835	-3.02289	-3.08502	-2.32901	-1.24991	-2.677	-2.677
1965	8	-5.85E-02	-1.6282	1.27966	0.668671	-1.08432	-0.21002	-0.21002
1965	9	-0.614868	-2.37125	-3.60736	3.3573	-0.13501	-2.83914	-2.83914
1965	10	-2.3403	-5.93866	0.725006	8.41E-02	-0.50565	-2.21436	-2.21436
1965	11	-2.11664	1.35895	1.47571	-4.29782	-1.09216	-1.73254	-1.73254
1965	12	-2.63281	-1.18979	-0.15955	2.29248	-3.60535	-3.8985	-3.8985
1966	1	-3.36276	-0.59708	-1.29556	-0.77567	0.615631	1.58838	1.58838
1966	2	-1.04453	-3.19876	3.35367	-3.08612	0.220306	-1.90939	-1.90939
1966	3	-2.63965	0.431976	-2.18002	3.25494	-1.17389	-4.44476	-4.44476
1966	4	-8.52E-02	0.660004	-3.4176	2.45575	-0.93424	-5.07645	-5.07645
1966	5	-1.9202	1.1911	1.08057	-0.41538	-0.82089	-0.88098	-0.88098
1966	6	-1.65152	-3.58548	-0.73587	-4.25815	-1.47119	-4.51E-02	-4.51E-02
1966	7	-2.18896	-2.35818	-1.19394	-0.76022	0.221588	-1.58112	-1.58112
1966	8	-4.64587	-1.0589	-0.25366	-1.42712	0.107269	-0.73752	-0.73752
1966	9	7.49E-02	-0.59757	-0.53107	-9.70E-02	-1.07193	-2.19644	-2.19644
1966	10	-2.1315	-3.09604	0.454803	0.243073	-2.30972	-3.96066	-3.96066
1966	11	-0.64032	3.86554	2.0694	1.58109	0.752747	-3.56384	-3.56384

1966	12	-3.78604	0.169525	-0.14127	1.60999	-1.23053	2.53192	2.53192
1967	1	0.761719	-0.2973	-1.49005	-1.11157	2.03223	2.78949	2.78949
1967	2	-1.72443	-0.57108	-0.24912	-4.99072	1.92831	2.58353	2.58353
1967	3	-3.21506	1.29898	-4.64493	0.300842	-1.97849	1.41794	1.41794
1967	4	1.02072	-0.38507	-1.06839	-4.50006	-0.42014	-1.48407	-1.48407
1967	5	-5.33E-02	-3.85468	0.994873	1.87253	0.560913	-0.31311	-0.31311
1967	6	-1.32773	-1.1774	-1.46768	0.635864	-0.52841	-2.30338	-2.30338
1967	7	-3.04526	-2.4375	-0.23703	1.18097	-0.64871	-3.44312	-3.44312
1967	8	-1.46E+00	0.297485	0.828247	0.101471	3.86E-02	-1.90384	-1.90384
1967	9	-3.19E-02	-3.08215	1.54025	0.241791	-1.00311	-2.64252	-2.64252
1967	10	-1.24692	1.32794	3.0173	-0.85553	-1.26465	1.73544	1.73544
1967	11	-1.57101	-0.15176	-0.87158	-4.53711	-0.35037	1.16467	1.16467
1967	12	1.44168	-2.6438	2.91855	-0.90283	2.59076	-4.14267	-4.14267
1968	1	-1.73965	-3.79868	-0.13217	4.32706	5.68265	0.933502	0.933502
1968	2	-4.04251	1.12015	-1.85373	1.4274	1.94769	3.52451	3.52451
1968	3	-0.192139	-1.79501	1.02557	-0.30435	1.69171	2.04694	2.04694
1968	4	0.591614	-2.00488	-3.49518	-0.93155	1.53506	1.89575	1.89575
1968	5	7.27E-02	-3.73248	-1.48083	-1.17218	0.781433	0.152191	0.152191
1968	6	-2.11081	-2.86227	-0.39197	-2.93146	1.43561	-0.86997	-0.86997
1968	7	-1.09076	-1.5188	-0.50272	-0.73392	0.677673	-0.7294	-0.7294
1968	8	-3.04059	-0.2298	-1.99207	-1.5007	0.721863	-1.20084	-1.20084
1968	9	-0.474091	-2.47455	-1.51505	2.36E-02	-1.97083	-1.05823	-1.05823
1968	10	-0.258118	-2.44196	-0.96271	-1.73853	1.29205	-2.34695	-2.34695
1968	11	-0.755615	-1.74335	0.416595	-4.81961	-2.01797	0.510254	0.510254
1968	12	-0.514618	-1.3671	2.84283	-2.02924	-0.85184	-1.94238	-1.94238
1969	1	-3.04306	-3.31888	-1.23697	-3.38815	0.197021	0.269684	0.269684
1969	2	-0.503326	-4.18286	-2.82693	-2.13211	-1.70529	3.03122	3.03122
1969	3	0.707062	-5.82E-02	-4.73105	-3.52505	2.69211	-4.89005	-4.89005
1969	4	-0.54599	-0.17468	-1.7695	-1.51947	-1.24115	-2.91406	-2.91406
1969	5	-2.0386	-0.7825	-1.35913	-0.46457	0.750916	-2.18381	-2.18381
1969	6	-1.89832	-1.99039	-2.63116	-0.22766	-1.12048	-4.87927	-4.87927
1969	7	1.61304	0.272522	-2.93524	0.278076	-0.41321	-2.65851	-2.65851
1969	8	-9.35E-02	-1.19562	-3.33005	0.67337	-0.45432	-1.75763	-1.75763
1969	9	-0.367889	-3.07837	-2.01855	0.771393	-2.43201	-3.57593	-3.57593
1969	10	-0.449402	-2.80585	-0.56381	-4.39871	-3.22925	-3.96716	-3.96716
1969	11	-3.82101	0.662231	0.902496	-0.99561	-0.99905	-2.65472	-2.65472
1969	12	-3.17072	0.858521	1.00836	0.414764	0.115448	-3.15298	-3.15298
1970	1	-1.63516	-0.84918	-3.54456	2.46573	-2.54166	-4.51132	-4.51132
1970	2	-1.95242	2.73602	-0.80771	-0.991	1.74109	-4.23328	-4.23328
1970	3	-3.61325	-0.5094	-2.46915	-0.83887	-2.33377	-1.83005	-1.83005
1970	4	-1.7886	3.94263	-3.6344	2.78143	-0.47363	-1.52197	-1.52197
1970	5	-1.51331	-1.44479	-1.85403	0.956329	-1.71918	-4.62149	-4.62149
1970	6	2.60E-02	-3.88049	-1.65158	2.66934	-0.97641	-0.90265	-0.90265
1970	7	-6.76E-02	-2.93738	-1.92242	-0.88901	1.81339	-3.66812	-3.66812
1970	8	-2.32446	-3.85062	-3.56305	0.157898	-0.95581	-1.30762	-1.30762
1970	9	-1.73557	-0.86136	-2.71396	1.01791	-1.53943	-3.62314	-3.62314
1970	10	-2.02002	-3.34836	0.263702	-2.76523	-1.69623	-2.51434	-2.51434

1970	11	-0.317017	-1.93817	1.68591	-0.6727	1.36694	-0.87674	-0.87674
1970	12	1.48318	0.71402	0.228455	0.324463	1.18387	0.377625	0.377625
1971	1	1.36993	1.17181	1.40573	1.50235	-2.35736	-3.87231	-3.87231
1971	2	-1.44482	2.53543	-3.99121	0.546906	-2.4411	-2.46667	-2.46667
1971	3	-1.20355	-0.19193	2.21106	-0.50095	1.72681	0.227631	0.227631
1971	4	1.0191	2.67081	-0.73938	-0.12555	-0.53644	-1.01736	-1.01736
1971	5	-1.94028	1.30301	-1.43652	1.34952	-0.76828	-0.6048	-0.6048
1971	6	-3.34293	-1.41949	-1.50586	1.49176	-1.0379	-1.26477	-1.26477
1971	7	0.274628	-1.75818	-1.86133	1.01929	-2.4765	-0.99442	-0.99442
1971	8	-0.44809	0.46109	-2.53165	1.59668	0.252991	-2.19003	-2.19003
1971	9	-2.04846	-0.94006	-1.93207	2.73621	3.23547	-3.15924	-3.15924
1971	10	-3.29822	-3.83426	1.6994	-2.17752	-2.08194	0.292236	0.292236
1971	11	-1.12442	-0.81027	-0.15228	1.52957	1.23553	-1.47223	-1.47223
1971	12	0.934265	1.2688	-4.35794	3.76007	1.64975	-4.7605	-4.7605
1972	1	5.62E-01	0.255402	-4.61365	4.75073	-5.12E-02	-5.10703	-5.10703
1972	2	2.37668	-4.91687	-10.514	3.17E-02	-5.22501	-1.77197	-1.77197
1972	3	2.57996	1.6033	0.268951	-4.68237	-3.55917	-3.34827	-3.34827
1972	4	-1.46109	0.567902	-1.83759	1.53375	-2.40173	-3.61206	-3.61206
1972	5	-1.70639	-1.504	-3.20093	0.221344	0.457733	-2.52881	-2.52881
1972	6	-2.19312	-0.25458	-2.05728	0.419556	-0.87741	-1.16806	-1.16806
1972	7	-0.904755	-2.28909	-1.75244	-2.04031	0.806793	-1.6438	-1.6438
1972	8	-3.05869	-0.3916	-0.85956	-4.5798	-2.42511	-3.58722	-3.58722
1972	9	-3.50906	0.562836	7.90E-02	-1.7243	1.27179	-0.94162	-0.94162
1972	10	-0.5867	1.80145	-0.43521	-0.47302	-0.53082	-2.26926	-2.26926
1972	11	-1.58572	-1.16016	-0.66168	-3.77661	0.410248	0.61087	0.61087
1972	12	1.20947	-2.44278	0.21756	3.04697	2.89896	-2.78E-03	-2.78E-03
1973	1	-0.503662	0.299408	0.705231	-1.29675	0.598938	0.832886	0.832886
1973	2	0.486267	-2.40677	0.109467	-2.5983	1.04739	-5.3985	-5.3985
1973	3	-1.39224	-3.75162	-0.81314	-2.37195	1.59262	-3.44867	-3.44867
1973	4	-2.3009	1.10141	-1.25E-02	0.610352	-4.11676	-2.22876	-2.22876
1973	5	-2.40799	0.137421	-0.42654	0.211517	0.773315	-1.97998	-1.97998
1973	6	-1.54132	0.264404	-0.36057	-1.20056	-0.16519	-2.48245	-2.48245
1973	7	-0.319458	-2.8443	-1.08734	-1.60141	-0.41962	-2.69281	-2.69281
1973	8	0.172119	-3.09293	-0.64975	2.53568	1.59949	-2.00424	-2.00424
1973	9	-4.89359	-5.05536	-1.27106	-1.61691	1.73709	-2.24283	-2.24283
1973	10	1.77051	-3.37604	-2.1254	2.64459	-2.88882	-2.40945	-2.40945
1973	11	-3.06284	0.95343	-0.2496	2.72247	-0.76358	-0.46405	-0.46405
1973	12	0.296265	-4.1185	-2.62766	-1.66061	2.82205	0.687317	0.687317
1974	1	-1.03625	-2.22458	-1.02847	-4.49887	1.63403	-4.6626	-4.6626
1974	2	-2.36041	0.500244	4.28058	-6.42532	4.53409	-4.3244	-4.3244
1974	3	0.574738	0.302399	2.25928	-6.65375	0.589417	-1.70575	-1.70575
1974	4	-1.36069	-1.91858	1.55411	-2.46826	-3.22714	-3.16046	-3.16046
1974	5	-3.13028	-2.2894	0.740265	0.904419	-1.63177	-1.1889	-1.1889
1974	6	-2.50403	-1.4809	-2.35626	-2.98825	-1.0076	-0.33176	-0.33176
1974	7	-0.751343	-1.50958	-2.71353	0.143768	-3.41241	-4.63751	-4.63751
1974	8	-4.67E-01	-2.16232	-2.40646	-2.03641	4.48E-02	5.04E-02	5.04E-02
1974	9	-2.06506	-0.27805	-0.56964	-0.98859	0.254395	-0.10083	-0.10083

1974	10	-4.05E+00	1.50E-02	-0.82431	-2.51361	-4.76E-02	-0.66217	-0.66217
1974	11	1.63428	2.03635	-3.0015	3.53427	-1.50708	-1.91873	-1.91873
1974	12	1.62506	-9.16E-02	-1.28516	-4.19391	-3.68314	-0.39078	-0.39078
1975	1	-6.21387	1.4357	-0.78726	1.57E-02	-0.30158	-5.88611	-5.88611
1975	2	-4.66452	1.89014	-2.99341	-3.18292	1.87201	-2.54239	-2.54239
1975	3	0.694763	-0.52921	1.09286	-2.21375	-1.83917	-1.53156	-1.53156
1975	4	-1.54449	-1.21259	-2.1604	-0.25415	1.56244	-1.02985	-1.02985
1975	5	-1.10388	-0.431	-0.40494	-3.56708	0.388031	-4.87369	-4.87369
1975	6	-1.56082	-1.79688	-1.03986	-2.52313	-2.0853	-1.98947	-1.98947
1975	7	-1.11307	-0.30377	-1.49582	1.14847	-2.8497	-2.67511	-2.67511
1975	8	-1.03857	-0.73023	0.283234	-3.48621	-0.99814	-4.72412	-4.72412
1975	9	-3.28589	0.254639	1.17E-02	-1.8522	0.833496	-1.80823	-1.80823
1975	10	0.952881	-1.46194	-2.28171	1.57449	0.677368	-0.30957	-0.30957
1975	11	0.495667	-2.20407	-0.69251	0.529877	-0.28546	9.48E-02	9.48E-02
1975	12	4.49786	-4.25098	0.674438	-0.96283	-5.32843	-0.71289	-0.71289
1976	1	4.36295	-3.1553	-0.36945	-2.94424	1.71783	-4.94061	-4.94061
1976	2	2.74176	1.27695	-1.11163	-2.20172	-3.8703	-1.86337	-1.86337
1976	3	1.94205	-0.52701	-5.19952	-1.19626	-1.57559	-1.39365	-1.39365
1976	4	1.31491	1.53912	-1.6218	0.549744	-2.06683	0.517731	0.517731
1976	5	6.32E-02	8.08E-02	0.95755	-3.80786	0.266022	0.19989	0.19989
1976	6	5.50E-02	-0.93518	-1.08215	-1.31726	-0.49829	0.405548	0.405548
1976	7	-1.90976	1.76831	0.424866	-1.18863	-2.34821	0.156799	0.156799
1976	8	-4.08E+00	1.93738	-0.52786	-1.3999	-5.10E-02	-1.11053	-1.11053
1976	9	-1.11346	-3.75476	1.12714	-3.54379	-0.97501	-0.40494	-0.40494
1976	10	0.660583	-2.04736	0.6091	-2.60E-02	-3.70145	0.532257	0.532257
1976	11	1.56287	0.269257	-1.04361	-1.82123	1.72284	2.98895	2.98895
1976	12	1.12686	1.3949	0.515045	-0.83841	0.584961	-0.82578	-0.82578
1977	1	0.922729	-2.1088	-1.06247	0.758942	1.61734	1.54578	1.54578
1977	2	-0.225037	-4.47757	-2.29633	-3.09262	-5.9278	-3.57968	-3.57968
1977	3	-3.21985	0.703003	-8.86945	1.26453	-1.22818	0.564636	0.564636
1977	4	-2.784	-2.30917	-5.065	1.47565	-3.08994	9.27E-02	9.27E-02
1977	5	-2.49118	2.50882	-0.23505	-2.04578	2.71033	-3.08908	-3.08908
1977	6	-1.62732	-1.70459	-1.72977	2.31665	0.27829	-2.18167	-2.18167
1977	7	-2.62216	1.31741	-3.31073	0.963989	1.30377	-0.82022	-0.82022
1977	8	-0.842163	0.4487	-3.63745	0.108093	0.730072	-2.11893	-2.11893
1977	9	1.70493	-4.38174	-2.98425	-0.95941	-1.01312	-1.90863	-1.90863
1977	10	-1.15E+00	-2.32275	2.86E-02	-0.52142	-4.55E-03	-0.77264	-0.77264
1977	11	0.97998	-0.28876	4.14081	1.77469	-0.57117	-1.80954	-1.80954
1977	12	-3.31E-02	-1.2995	-2.47336	1.56027	-1.34955	1.22083	1.22083
1978	1	-0.84256	1.52991	-1.54025	4.10025	-1.31897	4.87057	4.87057
1978	2	-2.96E-01	0.541046	-1.75412	-0.30551	-7.44E-02	1.35242	1.35242
1978	3	-2.00604	2.27408	1.57526	-1.70255	-1.08679	-3.41815	-3.41815
1978	4	-2.00348	0.204803	-4.9834	-1.37006	2.00586	-2.15787	-2.15787
1978	5	-1.66669	-1.10489	-1.43314	3.88022	-0.38168	-0.6499	-0.6499
1978	6	2.91718	-1.41779	-2.40176	-8.30E-02	-0.3909	-0.77905	-0.77905
1978	7	0.161255	0.327911	-2.53732	0.339081	0.592987	-2.5892	-2.5892
1978	8	1.71103	2.55688	-3.57434	3.38437	0.581573	-2.43292	-2.43292

1978	9	-3.69968	4.75626	-0.31885	-1.3255	0.111481	0.441284	0.441284
1978	10	2.71341	-0.29956	0.273987	4.1955	-2.15634	-1.76337	-1.76337
1978	11	2.32056	-1.33777	0.481018	-0.52573	-0.13098	0.535156	0.535156
1978	12	-1.15454	-3.40018	-1.78604	3.56018	0.695343	0.774628	0.774628
1979	1	2.14062	0.136108	1.57513	2.85834	-5.84637	0.380676	0.380676
1979	2	2.75436	0.341034	-1.72592	9.46E-02	1.7543	0.917511	0.917511
1979	3	2.82614	1.68958	-3.54303	3.86383	-0.35489	4.85825	4.85825
1979	4	-1.13608	0.175323	0.203217	-0.14676	-0.38165	-2.08026	-2.08026
1979	5	1.34091	2.3519	0.211456	-1.55777	-0.79459	-1.20139	-1.20139
1979	6	0.974091	-1.05649	-1.50388	-0.46726	-0.2937	0.378143	0.378143
1979	7	0.534943	1.67441	0.130859	-2.73181	-1.7063	-0.86731	-0.86731
1979	8	2.16321	-0.4971	0.732147	-0.55512	-0.51782	-2.07004	-2.07004
1979	9	-1.12607	-2.23654	-2.06036	-0.1817	-1.41772	-1.57333	-1.57333
1979	10	2.7175	0.464935	-1.40671	-1.46582	0.614777	-0.58255	-0.58255
1979	11	-1.26E-02	1.48785	0.572296	-0.30682	1.51303	2.11426	2.11426
1979	12	0.693787	0.308716	-1.40466	-0.98142	-0.52994	-3.19788	-3.19788
1980	1	1.62064	-2.84	1.02325	8.33905	2.12134	-1.10812	-1.10812
1980	2	0.31308	1.52072	-3.36432	2.91479	4.42941	2.9559	2.9559
1980	3	-4.15125	0.268677	1.21545	-2.11795	-1.19629	1.91513	1.91513
1980	4	-1.05029	1.82953	2.02271	2.91504	-1.75385	3.76373	3.76373
1980	5	1.3436	5.92E-02	-0.55414	0.446442	1.05551	-1.04071	-1.04071
1980	6	-4.29E-02	-0.2691	-0.92716	-3.10904	-0.38251	0.108826	0.108826
1980	7	1.02365	-3.0593	-2.52823	9.80E-02	-1.43402	6.68E-02	6.68E-02
1980	8	-2.99606	-2.53983	-0.47766	-1.14923	0.184967	-0.99374	-0.99374
1980	9	-2.98117	-0.24426	4.47064	-2.4418	-2.84262	2.85968	2.85968
1980	10	-1.9313	-0.19476	-5.62E-02	-1.23502	-0.20474	-1.90207	-1.90207
1980	11	-1.49954	-1.77496	-0.42481	-4.25571	-0.78156	-0.90424	-0.90424
1980	12	-4.88602	-3.94638	-1.94064	-5.02133	2.30475	-1.33948	-1.33948
1981	1	-3.03778	0.713196	1.33905	1.53714	4.39963	-2.4917	-2.4917
1981	2	3.83997	-1.47296	2.47107	-2.49252	0.151794	-4.97928	-4.97928
1981	3	0.433136	-1.17783	3.86627	-0.47897	-0.9404	1.31534	1.31534
1981	4	-1.17371	-2.1828	1.80371	1.67023	0.659058	1.05554	1.05554
1981	5	-0.851105	-2.56119	0.55127	-2.22076	1.53241	-0.6492	-0.6492
1981	6	0.231567	-1.6409	0.592834	-5.34E-02	-3.21109	1.49353	1.49353
1981	7	0.471954	-2.20328	-1.57672	-0.79163	0.349487	1.49429	1.49429
1981	8	-1.22E-01	-1.15472	-0.20895	1.58899	-4.36E-02	0.471466	0.471466
1981	9	-0.901581	-0.10895	-3.52585	-2.6456	-1.7897	-2.29153	-2.29153
1981	10	-8.65E-02	-5.36844	-2.77051	1.43719	-5.91E-02	-2.41727	-2.41727
1981	11	-3.72183	-3.19107	-3.63541	-0.67401	1.25983	-1.38864	-1.38864
1981	12	-1.61292	0.906525	-0.50314	2.43237	-3.76953	-2.83469	-2.83469
1982	1	-5.02048	-3.57401	-1.70306	1.82455	-1.68765	0.352478	0.352478
1982	2	-6.15E-01	-0.12335	-1.54971	0.179596	-4.60E-02	-2.6145	-2.6145
1982	3	-1.04605	-1.53E-03	1.39166	-3.62537	-3.75497	3.04694	3.04694
1982	4	-1.6972	-1.63757	1.48682	-3.46057	-0.78543	-1.08936	-1.08936
1982	5	-0.758881	-3.89999	0.244049	-2.03046	1.27573	-2.0863	-2.0863
1982	6	-1.78192	-1.34918	1.34073	0.704742	2.11819	-1.08475	-1.08475
1982	7	-4.09195	-3.22647	2.47296	-4.36163	0.528198	-2.8653	-2.8653

1982	8	-0.484467	-1.34781	-6.27E-02	-3.02951	-0.69083	-1.47385	-1.47385
1982	9	1.83182	-3.00E-02	-0.12436	-0.44769	1.99649	-0.12402	-0.12402
1982	10	-1.11832	-4.29E-02	-2.56439	1.2338	-2.06793	-0.14426	-0.14426
1982	11	1.10938	-1.94626	-3.79788	3.92548	0.41214	-2.99063	-2.99063
1982	12	0.647186	-1.66318	-3.90955	-5.44562	-5.97473	2.25281	2.25281
1983	1	-1.08386	-0.1575	-9.25E-02	-3.56335	0.571228	-5.51562	-5.51562
1983	2	3.06677	-2.92987	-3.54373	-2.14102	-3.24881	-6.38177	-6.38177
1983	3	0.828735	-0.35172	-0.13544	0.712738	-0.74429	-1.79996	-1.79996
1983	4	-1.22E-01	0.408813	0.4039	-0.70746	-1.03E-02	-4.04398	-4.04398
1983	5	-0.756378	-2.06918	-1.45883	-3.20547	-1.36926	-0.50479	-0.50479
1983	6	0.301086	-1.91E-02	-2.83215	-0.53375	1.81189	-1.52927	-1.52927
1983	7	-1.24835	2.20911	-1.34402	0.391266	-1.4823	-1.1394	-1.1394
1983	8	-1.36279	1.43E-02	-1.61624	-2.24011	-1.22394	-1.20334	-1.20334
1983	9	1.10672	-0.62436	-2.56155	-4.0181	-1.67661	-1.58813	-1.58813
1983	10	-3.47992	-0.20786	0.114807	6.55E-02	0.274872	-1.61536	-1.61536
1983	11	-2.76334	-0.79367	-1.63919	-1.98203	-3.03278	-3.64462	-3.64462
1983	12	0.866364	0.281097	-2.10657	1.14728	1.76666	-8.0116	-8.0116
1984	1	6.74E-02	-1.1608	-7.00095	-2.83377	1.05984	-2.97202	-2.97202
1984	2	2.62738	-3.12646	-5.27701	0.354706	2.5972	-1.88358	-1.88358
1984	3	-0.636658	0.12149	-2.15973	-0.79855	1.59332	-3.65094	-3.65094
1984	4	2.93372	-0.94339	0.892426	-1.39307	0.677856	-0.50076	-0.50076
1984	5	1.1774	-0.71118	1.33536	-0.38705	-1.25598	-1.09369	-1.09369
1984	6	1.25977	-1.4288	-1.48218	0.861938	-1.29919	-4.18146	-4.18146
1984	7	4.73E-01	1.2312	-0.18192	-2.89441	3.23E-02	-3.8992	-3.8992
1984	8	9.28E-02	-6.46701	-1.92294	-1.49402	-2.32541	-1.72894	-1.72894
1984	9	0.945618	-1.07477	-0.52277	1.76981	-2.90012	-3.63394	-3.63394
1984	10	-1.4726	-2.06604	0.920593	-0.42212	-2.34723	-3.12256	-3.12256
1984	11	0.944183	-1.29135	-4.30841	-0.77301	0.810547	-1.10605	-1.10605
1984	12	-1.32333	-0.58038	0.364746	1.67789	-2.20334	1.45142	1.45142
1985	1	-2.34918	-9.38E-02	-1.66025	0.64035	4.08673	-2.41702	-2.41702
1985	2	-2.19412	0.826935	-5.12421	5.371	3.22171	-1.9335	-1.9335
1985	3	-0.275665	6.72E-02	-5.14624	1.62125	1.4129	-3.14655	-3.14655
1985	4	-2.3978	2.18213	-1.6246	1.75415	1.77124	-4.36646	-4.36646
1985	5	0.779602	-0.81018	-1.59445	-0.16037	1.50851	-1.39331	-1.39331
1985	6	-6.88E-02	3.39651	-1.08707	1.01987	0.710999	-0.31567	-0.31567
1985	7	-1.39786	-0.90759	-1.14374	-0.86163	-0.86313	-0.10571	-0.10571
1985	8	-0.903076	-3.9798	-1.40195	-0.12512	-2.38571	-2.25513	-2.25513
1985	9	-0.829376	1.03183	-0.71536	2.21051	1.19427	-2.78812	-2.78812
1985	10	-0.561401	0.412445	-0.29779	0.264496	1.26736	-0.11096	-0.11096
1985	11	0.352478	-1.32205	0.749207	-1.63193	-0.88696	-2.73114	-2.73114
1985	12	-0.233612	1.72	-0.83585	-4.25351	-2.91254	1.28262	1.28262
1986	1	-2.27017	-0.629	1.93344	-5.17645	4.40503	3.3385	3.3385
1986	2	1.48776	1.05264	3.25189	-7.51331	0.298615	-0.45969	-0.45969
1986	3	-1.57764	-0.77622	0.428375	-1.63275	1.1792	-3.91406	-3.91406
1986	4	-2.36139	-1.26428	-0.18378	-2.10446	-1.04865	1.00873	1.00873
1986	5	-1.35379	-1.81299	-0.92163	3.54742	-0.31308	-2.04929	-2.04929
1986	6	-0.440308	-3.82867	2.76575	2.08597	0.780396	-0.99875	-0.99875

1986	7	0.606842	-1.00388	-0.91473	-2.21222	0.722687	0.621704	0.621704
1986	8	-0.389191	-2.43921	-1.02576	-3.2319	-1.43622	-0.48734	-0.48734
1986	9	-0.17038	-3.55975	-3.66776	0.778198	1.53458	-2.68433	-2.68433
1986	10	-1.60321	0.485657	9.06E-02	0.775085	1.19968	-2.31036	-2.31036
1986	11	-1.12231	1.73135	0.156311	-0.5585	0.227722	-1.20242	-1.20242
1986	12	0.509888	-0.4216	4.75E-02	3.08429	0.587646	-4.21518	-4.21518
1987	1	3.37003	-2.6633	-0.81317	4.27814	-1.71237	-3.57172	-3.57172
1987	2	-0.697815	-3.18246	-2.54883	4.4765	-1.37	6.95422	6.95422
1987	3	2.58826	-2.27621	-1.31433	0.573242	-2.44629	-2.07074	-2.07074
1987	4	-0.4552	-0.797	-3.44229	-3.27087	-1.24893	1.16483	1.16483
1987	5	-1.41269	-0.51437	-1.68073	-1.30356	-0.21619	-0.92551	-0.92551
1987	6	-2.62021	-8.75E-02	-1.17087	-4.67636	0.683716	-1.59747	-1.59747
1987	7	-1.49435	-1.78348	-0.23483	-3.26224	-0.81082	-1.1481	-1.1481
1987	8	-3.43619	9.71E-02	-2.25494	-2.50003	-1.53741	-0.54324	-0.54324
1987	9	-0.473877	-3.10486	-1.26385	2.04E-02	0.874481	1.41669	1.41669
1987	10	-2.87302	-1.62186	1.55231	0.489685	-2.26593	2.09375	2.09375
1987	11	1.03638	2.02884	-1.8201	-2.51532	-1.03818	-2.27045	-2.27045
1987	12	-0.302216	-1.97018	-0.69644	4.60397	-3.56793	3.62723	3.62723
1988	1	-0.204865	-0.86209	-3.09705	1.69943	-0.14597	-0.28622	-0.28622
1988	2	-0.152832	-1.22815	-2.96021	8.97568	-5.436	1.87122	1.87122
1988	3	-1.82886	0.929596	2.01166	3.09103	0.325012	0.90213	0.90213
1988	4	2.1972	-0.2468	-1.18359	2.44815	2.04544	-0.30017	-0.30017
1988	5	1.17792	2.94211	1.04425	-0.87628	2.32312	0.3013	0.3013
1988	6	0.405487	-2.26147	0.911346	-1.01874	2.38699	-1.04767	-1.04767
1988	7	-3.90045	-2.50769	-0.51843	-0.49262	-0.34982	1.93158	1.93158
1988	8	0.230225	-0.47421	-1.43375	2.99249	-0.41812	-1.01834	-1.01834
1988	9	-0.471588	-2.42966	-2.74765	0.470795	-0.62793	-2.71072	-2.71072
1988	10	2.0311	-2.30386	-2.04819	-1.32953	-1.72372	1.21933	1.21933
1988	11	0.566162	-0.94815	8.70E-03	2.28418	-1.47787	1.53638	1.53638
1988	12	1.23788	-1.5011	4.03793	4.99759	-1.38913	0.850403	0.850403
1989	1	-4.68256	-0.27298	1.86383	-1.04807	-3.74606	3.89099	3.89099
1989	2	-3.43454	-1.40985	0.550385	-3.67291	-1.58099	-3.66129	-3.66129
1989	3	-0.777863	0.322693	-2.02115	1.29175	1.26993	1.88474	1.88474
1989	4	-0.195099	2.23822	0.208618	9.60E-02	0.38266	1.22803	1.22803
1989	5	-0.939087	1.10431	0.716553	4.25E-02	1.65933	0.460999	0.460999
1989	6	-0.743225	-1.69839	-0.17798	1.14E-02	-1.4144	-0.63916	-0.63916
1989	7	-1.14517	-1.20547	-1.29044	0.719086	-1.3349	-0.41522	-0.41522
1989	8	-0.957886	-1.23102	-2.38785	0.534271	1.00989	0.353668	0.353668
1989	9	-1.63837	1.67786	1.60645	0.233002	-2.09531	-1.74194	-1.74194
1989	10	1.10638	-0.66586	1.67609	-0.64212	-1.61765	-0.52835	-0.52835
1989	11	0.788361	0.431641	-4.38748	-0.39203	1.18054	1.59058	1.59058
1989	12	-2.42883	-0.74008	1.18304	-4.05441	0.412262	-1.55798	-1.55798
1990	1	-2.36356	1.43512	-3.37527	-6.44925	1.16403	-4.6272	-4.6272
1990	2	-2.43613	-2.63275	2.96277	-1.77271	-2.98669	-0.7208	-0.7208
1990	3	2.58176	-6.11E-02	-2.09073	-1.75836	0.487427	-2.38394	-2.38394
1990	4	-1.4967	-1.82059	-1.38568	0.424927	1.91165	-3.07907	-3.07907
1990	5	-0.119598	1.00391	-2.85825	-0.78677	-0.44339	-2.21548	-2.21548

1990	6	0.14859	-0.80389	-1.78177	6.06E-02	0.548401	-2.40866	-2.40866
1990	7	-2.94E+00	-1.76599	-1.02884	3.13757	9.92E-02	-1.29532	-1.29532
1990	8	1.36533	-1.46323	-1.34845	-6.93E-03	-0.57202	2.17108	2.17108
1990	9	-1.33029	0.516632	1.36194	0.327209	0.139374	0.497864	0.497864
1990	10	-2.62399	-0.39194	-2.75699	-2.32193	2.67438	1.21634	1.21634
1990	11	-2.04013	-4.11737	0.321716	-5.0672	0.537018	2.08145	2.08145
1990	12	-0.647339	0.852417	0.520538	1.62167	2.51544	0.635803	0.635803
1991	1	0.471924	2.38181	2.58844	5.94E-02	-0.23337	3.25958	3.25958
1991	2	-3.14612	-1.67267	-0.10114	2.6044	-0.99539	-3.04028	-3.04028
1991	3	1.62216	-1.0936	1.52365	2.96243	-2.3761	-4.06165	-4.06165
1991	4	-0.604401	-1.7612	0.659302	0.91275	-2.54974	-2.96075	-2.96075
1991	5	0.501923	-0.97568	-0.87555	-1.57346	-1.01007	-1.4281	-1.4281
1991	6	-0.58963	0.244812	0.608246	0.551056	-1.23831	-7.23E-02	-7.23E-02
1991	7	-1.56787	-2.33469	0.210968	1.98758	-0.26563	1.56079	1.56079
1991	8	-2.86887	0.644287	2.62024	-0.39362	-1.43213	-1.43094	-1.43094
1991	9	-0.118591	0.652649	-2.31476	-0.78751	-0.77612	-1.87341	-1.87341
1991	10	-2.44632	1.83835	-1.81961	-0.52011	1.19485	-0.62634	-0.62634
1991	11	-0.825531	-0.99716	-0.85379	0.500275	-1.76398	0.502258	0.502258
1991	12	-4.54E-02	-1.80908	-2.66064	-2.49551	2.68246	-4.65228	-4.65228
1992	1	0.875427	1.02521	2.53693	0.86145	-0.60767	-4.702	-4.702
1992	2	-0.799011	-3.58426	2.52078	-3.021	-1.34698	-5.0228	-5.0228
1992	3	1.74216	-1.9259	0.708954	-2.44647	-3.88647	1.04013	1.04013
1992	4	-3.42499	-0.26648	-1.51529	-1.17526	-1.00916	-2.95795	-2.95795
1992	5	-2.3699	0.517303	-2.01273	-1.60898	-1.06589	-0.29489	-0.29489
1992	6	-1.68854	-1.13467	-2.10828	-2.87213	0.991211	-1.20267	-1.20267
1992	7	-0.889648	-2.42297	-0.11014	-2.96933	-1.91351	-2.00931	-2.00931
1992	8	0.223236	-2.20111	-2.12827	-2.96222	-1.83322	1.25916	1.25916
1992	9	-4.94E+00	-0.68317	-0.15006	-1.8779	-8.38E-02	-2.32022	-2.32022
1992	10	-6.73E-01	-3.42615	-3.44418	-4.29071	-1.43E-03	-1.59125	-1.59125
1992	11	-3.63E-02	-2.15897	-2.1073	-3.272	-0.52408	-0.38593	-0.38593
1992	12	-1.50E+00	-0.33588	-0.94617	-3.24643	4.96E-02	-1.4321	-1.4321
1993	1	-2.47507	0.749115	1.26505	-2.57126	-2.06036	0.949982	0.949982
1993	2	-0.672241	1.83664	6.65717	-3.37491	4.7699	-0.80368	-0.80368
1993	3	-1.63385	0.476593	0.960754	1.27823	-0.7905	1.01984	1.01984
1993	4	0.947601	-0.16299	-0.31848	-1.77457	0.139648	-2.94E-02	-2.94E-02
1993	5	0.32431	-2.69299	-0.83795	3.11E-02	-1.75998	-0.43179	-0.43179
1993	6	-0.347137	-0.38889	-0.65857	-1.96765	-0.58939	0.420532	0.420532
1993	7	4.98E-01	-0.97669	-0.63782	-0.41693	5.17E-02	7.01E-02	7.01E-02
1993	8	-8.77E-01	0.222504	-0.79956	-1.51962	-7.95E-02	1.75937	1.75937
1993	9	-1.48468	-1.66464	-0.76697	2.3053	-1.89243	-0.47824	-0.47824
1993	10	-1.8577	0.901642	-0.19309	-0.76892	1.08118	-0.89645	-0.89645
1993	11	0.512268	-0.14716	-1.7662	-2.62363	-3.71365	1.88455	1.88455
1993	12	0.851166	-4.06348	-0.43875	-3.42023	-3.64883	4.0079	4.0079
1994	1	1.93573	-0.90448	-4.26535	3.18146	-5.26917	3.0347	3.0347
1994	2	1.01517	1.52612	-4.40613	2.91818	0.3526	0.507904	0.507904
1994	3	-0.647247	-2.65271	-5.83804	-1.33698	2.66013	-0.53366	-0.53366
1994	4	-0.562103	-2.98767	-2.00027	-1.62567	0.31485	0.337341	0.337341

1994	5	-2.34839	-0.8685	-0.64725	2.80804	-2.82019	-3.0087	-3.0087
1994	6	-1.71423	1.6709	0.663544	-1.18436	0.635712	0.681549	0.681549
1994	7	-1.05E-01	-0.7002	-1.61353	1.71359	-1.71E-02	0.655304	0.655304
1994	8	-0.268463	-1.34412	-1.03674	-0.93332	0.141083	0.921082	0.921082
1994	9	-1.21268	0.50705	-0.21915	-6.96E-02	3.12909	-3.33292	-3.33292
1994	10	-0.84491	3.03574	-1.59048	-1.3074	-2.80295	-1.69696	-1.69696
1994	11	-2.19E+00	0.993439	1.92E-02	0.5	-5.01E-02	-2.13013	-2.13013
1994	12	-0.846527	0.904999	-0.79337	-3.75104	0.334045	0.83963	0.83963
1995	1	-1.97388	2.15002	-0.87116	-2.37207	-4.08325	0.980377	0.980377
1995	2	1.61298	-4.03436	3.24197	-4.18152	-3.10989	4.20493	4.20493
1995	3	2.53775	-4.52481	-2.78165	-4.74597	1.2749	-1.02954	-1.02954
1995	4	2.521	2.03052	-3.48978	-3.60077	0.666046	1.16843	1.16843
1995	5	0.5383	0.657501	-0.67664	0.878418	-0.98846	0.757416	0.757416
1995	6	-4.30261	0.909821	-1.07578	-2.52295	-0.58231	1.71564	1.71564
1995	7	0.980438	1.24231	-1.63062	1.72678	-0.10791	-1.93671	-1.93671
1995	8	-1.75E+00	-0.69382	-1.28046	-1.35861	-8.55E-02	-3.65073	-3.65073
1995	9	0.151733	1.07925	-0.88464	2.89441	1.35138	-3.34384	-3.34384
1995	10	-2.65179	1.56085	-0.62021	0.375671	2.16016	-1.15125	-1.15125
1995	11	-0.920044	-3.32617	-4.26001	1.39648	-1.07187	-1.24554	-1.24554
1995	12	-4.72742	4.40021	-2.62344	-7.45572	-2.39035	5.26233	5.26233
1996	1	-0.379578	-0.89999	-2.34927	-4.91245	1.76074	1.3129	1.3129
1996	2	-8.96E-02	1.02414	-2.16882	-4.612	0.985291	2.78491	2.78491
1996	3	-1.68674	2.82758	-4.64584	-1.01007	3.75043	-0.32886	-0.32886
1996	4	2.27322	-0.68158	-2.23279	-2.67746	1.58676	-1.93057	-1.93057
1996	5	-2.46729	0.121124	3.91E-02	-2.93686	-0.42407	-2.09628	-2.09628
1996	6	8.27E-01	-1.0426	1.68604	3.20996	-8.76E-02	-1.50345	-1.50345
1996	7	-3.10095	-1.51257	-1.22653	-0.54361	1.2565	-2.0018	-2.0018
1996	8	-0.320587	1.71E-02	-0.11795	0.489197	-1.53232	0.13327	0.13327
1996	9	-2.23349	0.614349	-3.50577	1.75891	0.980591	-1.13104	-1.13104
1996	10	-1.70721	-0.93234	-3.12219	-0.98331	-0.11734	1.53E-04	1.53E-04
1996	11	-1.12802	-0.13925	-0.66541	0.161774	-2.47528	0.306763	0.306763
1996	12	-0.474823	0.418121	-3.19415	-1.42072	-3.25113	-5.19769	-5.19769
1997	1	0.492828	0.750702	-3.79617	0.538239	0.412445	3.30338	3.30338
1997	2	5.43347	2.26184	4.08578	3.0242	3.72562	5.54343	5.54343
1997	3	2.70483	-0.51502	2.00336	1.19385	0.962128	2.87595	2.87595
1997	4	3.56232	0.121429	-1.6615	-3.75665	0.304047	-0.90906	-0.90906
1997	5	-2.52E-01	1.13641	-0.63083	-2.50757	-3.95E-02	0.490692	0.490692
1997	6	0.309387	-0.13168	-0.90698	-1.61694	0.577209	0.84613	0.84613
1997	7	2.61884	1.71481	-0.21375	-0.48511	3.38217	1.06979	1.06979
1997	8	0.138916	1.74869	1.60315	-2.10852	-0.72452	0.767273	0.767273
1997	9	1.48883	-3.77417	1.74234	2.755	-1.27103	2.48978	2.48978
1997	10	-1.34842	-0.90735	1.06259	-1.76611	-0.24854	1.99615	1.99615
1997	11	-1.79303	-0.58334	1.93829	-2.79871	1.91965	-1.99234	-1.99234
1997	12	2.13757	-1.7355	0.350342	-4.13593	5.74036	2.1022	2.1022
1998	1	-0.981262	-2.6008	-0.57437	3.89066	1.64044	0.925201	0.925201
1998	2	-0.546631	1.11884	1.76767	2.10809	-0.32639	5.8905	5.8905
1998	3	-0.416656	0.151276	6.46286	0.326233	2.37341	-0.81705	-0.81705

1998	4	0.441101	-7.87E-03	2.9176	-0.40778	-2.23694	3.70285	3.70285
1998	5	2.10632	-0.4173	-0.12784	2.69403	-0.51309	1.8483	1.8483
1998	6	-0.239716	2.16962	-0.73248	-1.59406	-0.54721	1.50574	1.50574
1998	7	-1.87027	0.547211	-0.10822	0.299286	-1.56662	2.28339	2.28339
1998	8	-0.13858	0.224487	2.96603	2.28778	0.578766	0.649872	0.649872
1998	9	0.15741	-0.52057	1.26486	0.597412	-0.52771	1.42618	1.42618
1998	10	-0.861115	0.939056	-2.39319	4.07318	1.90256	2.67395	2.67395
1998	11	-0.512024	-2.79645	0.80011	-2.2034	-0.87466	-3.39163	-3.39163
1998	12	-1.95001	1.34E-02	3.72003	-0.21802	-0.21564	-1.12888	-1.12888
1999	1	0.69754	-0.1102	-2.37445	2.33066	1.77713	0.775879	0.775879
1999	2	-1.66483	2.96722	0.887482	2.56238	-4.25491	2.8403	2.8403
1999	3	-3.02E-02	5.77E-02	-0.51202	1.94275	-0.90237	1.55106	1.55106
1999	4	2.96472	-4.6442	1.64011	1.41583	-0.85486	-0.79575	-0.79575
1999	5	1.06E+00	-0.633	-0.64923	1.06302	4.95E-02	0.279419	0.279419
1999	6	1.69E-01	-0.349	2.05423	0.741669	6.06E-02	2.35333	2.35333
1999	7	1.15103	-1.2504	4.21338	-0.88532	0.8638	1.72659	1.72659
1999	8	-1.50998	0.623779	1.61154	1.51208	-0.32132	2.27597	2.27597
1999	9	-0.884766	-0.75314	4.07376	-0.383	-0.88791	2.43036	2.43036
1999	10	-2.00479	1.83694	0.222412	1.65939	1.96567	-0.74414	-0.74414
1999	11	-2.68481	0.795746	2.31891	1.4538	1.56314	0.844971	0.844971
1999	12	1.16309	3.52722	2.50986	-5.22092	2.72064	-1.58459	-1.58459
2000	1	3.68E+00	-0.34979	1.98975	0.698639	-3.29E-02	2.05258	2.05258
2000	2	1.57129	-1.44357	-1.79843	-1.4176	-0.90701	-6.01819	-6.01819
2000	3	3.02945	0.407288	1.81927	1.12274	2.54562	0.533936	0.533936
2000	4	-5.48E-02	-1.08209	-0.7507	0.43045	-2.01114	1.21613	1.21613
2000	5	-1.1022	-3.00479	0.853058	1.57224	-0.15057	2.32721	2.32721
2000	6	1.81018	0.2258	0.929535	5.35306	-0.99411	-0.53647	-0.53647
2000	7	2.24014	-1.2789	0.709167	2.54218	0.135681	-1.1044	-1.1044
2000	8	-0.676483	-1.55103	1.04935	1.84399	-0.31912	-1.68683	-1.68683
2000	9	7.63E-03	-1.13657	-0.86237	2.43381	-1.0708	-0.69122	-0.69122
2000	10	-0.923218	2.49554	-1.93109	2.70239	0.396362	-2.77747	-2.77747
2000	11	1.53836	-0.67456	3.96E-02	-1.0549	-3.05597	-3.41632	-3.41632
2000	12	-4.04462	1.604	4.83E-02	2.77829	3.21967	-1.72717	-1.72717
2001	1	1.61893	1.35541	0.886627	-0.56177	-1.04257	-1.76392	-1.76392
2001	2	0.771484	-3.96707	2.54227	-3.14651	-1.47198	-6.97119	-6.97119
2001	3	-2.10587	3.70679	-2.57654	1.66064	1.04462	-0.75824	-0.75824
2001	4	-1.78778	-0.39438	-0.7677	-1.04935	0.161163	-2.07376	-2.07376
2001	5	-0.293091	-0.67319	0.655853	-0.83395	-1.32047	2.50571	2.50571
2001	6	1.52307	-0.84088	0.334534	-1.45044	-0.82941	0.418427	0.418427
2001	7	-0.615662	-0.61539	1.92017	0.955872	-1.4989	-1.91052	-1.91052
2001	8	1.40561	0.145477	0.442261	-2.71451	2.19977	0.266663	0.266663
2001	9	1.44571	1.04935	3.67746	-1.8356	0.473083	-0.58142	-0.58142
2001	10	2.34338	1.07266	1.01071	2.17908	-0.68683	1.72565	1.72565
2001	11	0.968384	-0.19107	3.01682	4.67908	3.64853	2.28726	2.28726
2001	12	2.73056	-0.77988	1.30493	-0.74353	-0.90134	0.321411	0.321411
2002	1	-1.12875	-2.2771	-0.23645	-1.19647	0.791229	-4.2139	-4.2139
2002	2	-1.41232	0.210846	2.88068	-2.42081	2.99442	-2.8158	-2.8158

2002	3	2.70764	-0.5737	7.71918	-0.59576	-1.88358	4.78094	4.78094
2002	4	0.214722	-0.27429	-1.0061	1.17133	0.230865	-0.34836	-0.34836
2002	5	2.05112	1.18912	0.289062	-0.98837	-2.54037	1.03592	1.03592
2002	6	0.350464	1.63962	2.55002	-1.37283	0.964691	-1.37E-02	-1.37E-02
2002	7	-0.40567	-0.9372	4.72217	0.283081	-0.76331	-0.16962	-0.16962
2002	8	-1.02039	-1.66901	2.71234	-2.05133	-2.37473	-7.26E-02	-7.26E-02
2002	9	1.80762	2.11505	2.81046	-3.0997	1.27017	-1.61374	-1.61374
2002	10	3.9454	2.11444	-0.25061	0.100494	0.346466	-0.66815	-0.66815
2002	11	0.582581	-1.16107	-0.5285	-3.75052	2.15262	0.21225	0.21225
2002	12	1.47986	-0.20108	-5.37256	0.221283	2.72275	0.825623	0.825623
2003	1	-6.40E-02	1.98962	-1.47186	0.741333	-0.13666	1.8797	1.8797
2003	2	-0.424316	0.827148	-5.26901	1.34808	2.99551	-1.61697	-1.61697
2003	3	0.444763	0.891785	-6.25534	-1.51978	2.19443	1.04434	1.04434
2003	4	-0.440796	3.1817	-0.58228	0.744324	2.78204	-1.10257	-1.10257
2003	5	1.89282	-0.13098	-1.68423	2.12262	2.66074	0.967804	0.967804
2003	6	0.347992	-0.49689	-0.79807	-0.82306	2.8208	0.481323	0.481323
2003	7	3.40E-01	2.23651	-1.27722	1.85748	7.74E-02	9.82E-02	9.82E-02
2003	8	0.948914	3.63278	0.277344	1.03497	2.36249	-0.82672	-0.82672
2003	9	0.394409	-1.80966	-1.80774	-2.2197	-0.50763	-2.72253	-2.72253
2003	10	1.4682	2.14404	-0.164	-1.1954	-0.25043	-0.57626	-0.57626
2003	11	-1.32E-01	-1.80725	-3.21118	2.33188	5.52E-02	0.731873	0.731873
2003	12	4.38248	2.22742	0.122162	-4.29044	-1.95544	-0.49628	-0.49628
2004	1	1.42133	-0.49368	2.09653	-2.80E-02	-2.73657	1.58249	1.58249
2004	2	-0.115936	3.75345	2.51529	-0.4382	-1.30301	1.0329	1.0329
2004	3	0.426636	4.2319	6.23E-02	1.36523	-0.12958	1.69095	1.69095
2004	4	0.953796	3.60632	-1.3432	1.92725	-0.20395	-0.40237	-0.40237
2004	5	3.18451	-0.61249	-0.24735	8.27E-02	-1.32559	-0.3205	-0.3205
2004	6	-4.85E-01	-1.27979	0.404938	-2.38065	-4.14E-02	0.187225	0.187225
2004	7	5.31E-02	0.46283	-1.10193	0.579376	-1.11981	-0.74231	-0.74231
2004	8	1.01422	0.586304	-2.72934	3.84308	-2.57043	2.29218	2.29218
2004	9	-2.14249	1.34744	-2.50424	-1.16779	1.03717	2.41806	2.41806
2004	10	-0.376617	1.33005	1.04669	0.218781	-1.05585	0.294647	0.294647
2004	11	-4.29E-02	-0.25366	2.7966	2.37	2.36993	-8.45E-02	-8.45E-02
2004	12	-1.71994	-0.8143	-1.48834	2.96799	1.49005	1.12112	1.12112
2005	1	1.66882	-0.4046	-1.63977	-0.89816	0.169647	3.08688	3.08688
2005	2	-0.799622	0.594635	1.75507	4.11719	0.489807	2.81262	2.81262
2005	3	-0.290741	-0.94351	2.11646	-1.25565	-2.0871	-3.27716	-3.27716
2005	4	-1.0972	-0.23309	2.84232	-0.13635	0.19516	-1.67355	-1.67355
2005	5	0.418304	1.23492	1.68057	0.380524	2.09811	2.28009	2.28009
2005	6	0.638275	-0.1676	1.15292	0.875244	2.4006	0.584625	0.584625
2005	7	-0.68396	0.468903	0.855774	0.630981	1.422	-0.76581	-0.76581
2005	8	-1.92249	0.901489	0.954834	0.85318	1.32889	-0.30203	-0.30203
2005	9	-0.162079	1.45364	-0.72687	1.43509	4.04858	1.97238	1.97238
2005	10	-3.99E-02	-2.91595	1.93719	0.983185	1.19055	-0.57736	-0.57736
2005	11	1.58939	0.777557	1.24469	-2.91541	-1.66797	2.28458	2.28458
2005	12	-1.76874	2.71182	6.74E-02	-0.99301	-5.55435	0.232117	0.232117
2006	1	-3.62198	2.95462	-0.30875	-4.04034	-6.49066	2.06238	2.06238

2006	2	-3.20602	-1.82196	2.90887	-6.073	2.91949	-1.4505	-1.4505
2006	3	-3.01315	-1.4624	-0.18283	-1.57E-02	0.229401	1.72156	1.72156
2006	4	0.37851	-3.78E-02	0.700897	-0.34427	1.99994	0.19165	0.19165
2006	5	0.670197	1.51321	-0.57465	-0.59848	1.12051	7.24E-02	7.24E-02
2006	6	2.58029	1.89771	0.695618	1.12686	1.6011	-0.84326	-0.84326
2006	7	1.22174	0.76593	0.517975	0.737274	3.44849	1.9223	1.9223
2006	8	2.29623	3.3392	0.59964	1.27499	3.33658	-2.51154	-2.51154
2006	9	3.72852	2.29236	2.84274	3.6113	2.3205	0.707458	0.707458
2006	10	2.8107	1.46875	2.55069	-0.7756	0.391174	-0.53037	-0.53037
2006	11	1.30646	-2.05667	-2.10071	0.4104	2.95374	-1.69724	-1.69724
2006	12	1.18228	0.656525	0.235962	2.54218	1.35666	-4.72937	-4.72937
2007	1	2.66083	0.843323	-4.90E-02	-3.52316	0.249146	-2.0546	-2.0546
2007	2	-0.974335	-3.04837	4.24438	-1.06442	-1.13519	0.608215	0.608215
2007	3	0.778534	-0.79791	-3.02554	-9.56E-02	-1.11508	2.70786	2.70786
2007	4	1.65372	0.177429	-0.9519	0.383026	0.132965	1.84503	1.84503
2007	5	0.854095	1.44321	0.823364	-3.43958	0.337311	-1.9603	-1.9603
2007	6	-3.59E-02	-0.4379	-0.59546	-0.70456	2.17331	-0.68985	-0.68985
2007	7	1.62903	-0.79028	-1.31384	0.337891	-0.1734	-0.13052	-0.13052
2007	8	2.49313	-0.2872	1.51126	-2.9566	1.13107	-1.31772	-1.31772
2007	9	0.140533	0.934937	-1.78326	-1.18121	1.64249	-1.56741	-1.56741
2007	10	8.58E-02	-1.55255	-2.76801	1.92859	-0.13455	-0.57047	-0.57047
2007	11	0.666656	1.08655	0.44339	3.87338	-1.45987	0.270172	0.270172
2007	12	0.893768	0.4776	-2.00577	2.08908	3.36255	1.79303	1.79303
2008	1	-2.45978	-1.90329	1.36935	5.42404	-1.80807	3.25659	3.25659
2008	2	-0.729523	-0.25247	2.16E-02	3.4126	1.48019	1.01022	1.01022
2008	3	-1.73514	1.0455	-0.53003	6.53152	1.96552	-3.84256	-3.84256
2008	4	-0.760376	-2.33328	-0.48999	4.11444	2.15524	-1.25607	-1.25607
2008	5	0.945618	1.36481	0.116455	1.90262	-0.30386	1.814	1.814
2008	6	-2.66992	-0.28879	0.464722	4.09766	-2.4809	0.697449	0.697449
2008	7	2.61804	2.94672	-0.43692	1.30847	-0.6828	4.48E-02	4.48E-02
2008	8	-0.849976	2.50208	-0.88074	2.30539	-1.42331	0.392273	0.392273
2008	9	3.85092	-0.78937	-0.91824	1.10159	-0.53082	2.16968	2.16968
2008	10	-1.19492	-1.41434	-1.10849	-1.02893	-1.89044	0.293549	0.293549
2008	11	-0.452332	0.787628	0.620514	1.2193	1.07764	-3.05463	-3.05463
2008	12	1.81128	2.07321	3.04495	5.78308	0.343353	1.89713	1.89713
2009	1	2.89233	1.78101	0.728638	-3.66E-04	1.24182	0.259094	0.259094
2009	2	4.83E-01	0.484924	0.666565	10.0232	2.88E-02	2.20352	2.20352
2009	3	3.84854	-2.61581	1.29715	2.95312	-0.17279	1.27914	1.27914
2009	4	-1.62869	-1.07108	-0.55869	-1.24887	0.65744	-5.47E-02	-5.47E-02
2009	5	-2.14E+00	2.1452	2.02197	0.686646	-8.58E-02	-0.27539	-0.27539
2009	6	1.61258	-0.33698	0.958832	-1.87103	0.814392	-0.49667	-0.49667
2009	7	-0.110962	-0.92688	0.130371	1.62466	1.543	1.11948	1.11948
2009	8	2.28821	2.84598	0.579346	-1.85483	1.74988	0.267181	0.267181
2009	9	-0.475189	-0.85846	-0.77756	1.75589	0.136993	2.16196	2.16196
2009	10	-1.0383	-1.04654	-2.72171	-0.76602	2.90335	1.93845	1.93845
2009	11	-0.777222	-2.57666	1.84561	-2.26071	1.65604	0.73175	0.73175
2009	12	4.53296	0.526398	1.55145	2.43439	3.17737	1.29382	1.29382

2010	1	4.88492	2.9877	0.96994	3.76166	-4.48837	1.6228	1.6228
2010	2	2.92789	-1.65137	-1.71E-03	-0.71542	0.534515	-0.1163	-0.1163
2010	3	-3.81354	-1.08051	2.02997	0.63205	1.24902	-1.18585	-1.18585
2010	4	-0.56308	1.03381	1.3938	1.53665	0.615143	0.411224	0.411224
2010	5	-0.292694	-1.09778	1.69427	4.27383	-2.81677	1.73691	1.73691
2010	6	0.601776	-0.10358	1.91983	4.23035	-1.55539	2.60632	2.60632
2010	7	0.646637	0.868408	1.08026	-9.72E-02	-2.42322	1.7897	1.7897
2010	8	1.19531	4.0777	2.65173	4.01489	-0.55463	2.11557	2.11557
2010	9	2.00543	0.762756	0.445038	5.14651	-3.32721	1.59857	1.59857
2010	10	-0.117615	2.21625	1.83389	3.98E-02	-1.35922	-0.43765	-0.43765
2010	11	0.753082	1.24866	1.10172	1.2883	0.525421	3.59396	3.59396
2010	12	-3.32364	-0.29849	1.64163	0.901978	2.52615	3.02121	3.02121
2011	1	0.98642	0.46991	0.729736	-1.32297	-1.84167	4.49E-03	4.49E-03
2011	2	-2.25851	3.06113	-5.96793	-6.39801	0.447113	-1.01758	-1.01758
2011	3	1.61636	0.856995	2.90115	0.924347	0.704712	0.393341	0.393341
2011	4	-1.2399	-2.3389	1.70493	1.96124	-1.28604	1.35413	1.35413
2011	5	0.786621	-1.20148	-0.71033	-0.61118	1.00873	1.54062	1.54062
2011	6	-0.596832	-0.51248	7.49E-02	2.26785	1.79831	-0.50577	-0.50577
2011	7	-0.257965	-2.0806	0.330566	0.395172	2.0484	2.7012	2.7012
2011	8	-2.74539	-0.93832	2.04306	-2.12241	0.279785	2.24637	2.24637
2011	9	0.811829	0.794647	1.34036	-3.0376	0.682983	1.68079	1.68079
2011	10	1.3786	1.05435	3.00769	-2.7691	0.224365	2.57385	2.57385
2011	11	9.94E-02	-1.00735	-0.73789	0.367188	0.569122	1.47726	1.47726
2011	12	0.636871	2.11612	5.74185	-0.58453	-1.53625	-1.39059	-1.39059
2012	1	-3.20267	1.20712	-3.72885	-1.74646	-0.28647	-5.49982	-5.49982
2012	2	0.240265	5.06354	0.989685	4.7348	-2.1434	-5.15698	-5.15698
2012	3	-0.945038	7.16E-02	-3.24142	2.20004	-0.7833	-4.74936	-4.74936
2012	4	-0.132477	2.09512	1.41342	-1.41586	0.631958	-1.54767	-1.54767
2012	5	-0.360687	-0.15729	-1.70493	3.67023	-1.14398	2.07251	2.07251
2012	6	1.57059	2.13501	-1.95038	-0.75815	-1.16211	1.21445	1.21445
2012	7	6.38E-02	1.80792	-0.73773	-0.78732	-0.70532	1.6701	1.6701
2012	8	1.00583	2.3476	-0.70886	1.55139	-0.15314	1.83588	1.83588
2012	9	1.69211	0.47934	0.849854	1.25229	-2.38773	2.55548	2.55548
2012	10	0.507599	3.02786	-0.4989	0.865692	0.170349	2.22064	2.22064
2012	11	3.32297	3.41956	0.674103	1.92218	2.45084	1.87186	1.87186
2012	12	0.368774	-2.45029	-0.79794	-0.85852	2.24167	2.73792	2.73792
2013	1	2.41122	0.583008	-0.43097	-1.74554	2.39822	1.048	1.048
2013	2	-2.19522	-1.62756	-5.18451	3.62219	2.36551	3.96542	3.96542
2013	3	0.14505	-1.69592	2.69208	-1.54047	-1.0748	2.81863	2.81863
2013	4	1.24841	-2.19937	3.15591	1.12903	1.06726	3.12225	3.12225
2013	5	1.69342	-1.65878	0.74527	-1.31836	2.45291	-0.9234	-0.9234
2013	6	3.43799	-2.78668	0.762329	2.11624	-1.39709	0.794952	0.794952
2013	7	3.44055	-0.38428	2.08936	-0.47812	-0.1716	1.2103	1.2103
2013	8	1.83704	-1.48001	2.22314	-1.86E-02	1.71176	1.34457	1.34457
2013	9	-0.357483	-0.28006	3.19165	-1.36E-02	-1.50043	0.877075	0.877075
2013	10	1.44739	1.96E-02	2.9931	0.227173	0.511078	2.86694	2.86694
2013	11	-2.57974	2.78934	2.42929	1.03137	0.292419	-0.24454	-0.24454

2013	12	0.221985	-0.9343	2.30826	1.28839	1.44077	-1.4585	-1.4585
2014	1	-1.43268	-3.26868	2.54163	0.261841	1.03732	-1.11111	-1.11111
2014	2	0.322174	-1.84238	-1.08701	1.15518	4.6748	-1.86868	-1.86868
2014	3	7.35E-03	9.48E-02	2.05096	1.92584	1.8107	0.408234	0.408234
2014	4	2.29901	-1.5275	2.6369	1.74744	0.776642	-0.13358	-0.13358
2014	5	2.09332	0.454407	0.746368	-1.43286	0.714325	2.18289	2.18289
2014	6	-0.30603	3.478	1.50952	-0.91785	-0.46658	2.51535	2.51535
2014	7	1.72446	0.441315	2.87848	0.127991	0.949371	1.819	1.819
2014	8	0.915527	-0.93402	2.68805	-0.21323	0.830688	0.630768	0.630768
2014	9	1.73141	3.88934	1.11465	-0.22971	0.483978	0.689362	0.689362
2014	10	2.5603	-0.12756	2.4454	-1.11511	0.605377	1.12164	1.12164
2014	11	-0.290436	2.70053	1.26801	-1.39172	0.232635	1.49567	1.49567
2014	12	-0.319122	0.561523	2.67014	3.11337	0.727753	1.12192	1.12192
2015	1	0.43573	-0.83389	5.62125	-0.84595	3.09943	4.00909	4.00909
2015	2	-3.40723	4.87195	-2.22681	0.679382	1.56039	4.0842	4.0842
2015	3	-3.12286	0.220093	-1.75354	3.19485	0.105103	3.86853	3.86853
2015	4	3.95932	1.37311	1.19522	-1.91956	-2.12103	1.77615	1.77615
2015	5	0.224701	1.16953	2.74615	-0.20728	0.467712	-0.39841	-0.39841
2015	6	7.63E-04	0.257111	2.97452	1.32535	1.86401	0.524139	0.524139
2015	7	2.30634	2.21432	2.97687	1.94217	1.48129	-0.71811	-0.71811
2015	8	0.599609	1.10709	1.49963	1.142	0.727264	1.65268	1.65268
2015	9	3.03732	1.88666	2.82224	-3.94128	-1.5957	0.270874	0.270874
2015	10	2.91681	-2.20956	2.98169	-3.45621	0.141968	8.58E-02	8.58E-02
2015	11	1.56186	-0.22977	1.7778	2.36447	1.38992	-0.67575	-0.67575
2015	12	-1.42334	1.64151	0.17804	0.553467	2.11865	-1.60239	-1.60239
2016	1	2.44702	0.484009	6.95325	-5.65E-02	0.705627	3.6506	3.6506
2016	2	0.252167	4.27142	0.669495	0.210999	-5.57599	2.90271	2.90271
2016	3	0.649353	0.993591	1.42407	-1.50165	-1.86569	1.76175	1.76175
2016	4	2.20001	3.89383	-0.92029	-3.16046	0.970245	2.24005	2.24005
2016	5	2.6933	3.0535	-1.11954	-3.51688	-0.26196	3.1806	3.1806
2016	6	0.411163	1.7699	0.40744	-3.05E-03	-1.25409	-0.90488	-0.90488
2016	7	1.70865	0.6875	1.38235	0.603363	-0.60632	-0.198	-0.198
2016	8	1.47751	-1.6991	0.746735	2.27258	1.16766	1.33676	1.33676
2016	9	3.07123	3.03363	-0.78656	-2.3063	-0.11432	1.31558	1.31558
2016	10	0.48349	1.79874	1.6366	-2.1777	-0.42923	0.299347	0.299347
2016	11	-1.50833	3.34964	-1.05051	2.13809	-0.53488	2.23727	2.23727
2016	12	0.118683	-1.48639	3.92484	6.96567	-4.41504	2.79303	2.79303
2017	1	-2.76187	1.4361	2.02173	-1.93106	0.905823	1.78738	1.78738
2017	2	-1.49524	2.97293	3.38187	5.22418	-0.64151	1.2106	1.2106
2017	3	-0.508942	-2.44211	-1.37595	3.71664	0.155823	-0.79517	-0.79517
2017	4	0.785919	3.20621	1.36823	1.47083	-0.68475	0.782837	0.782837
2017	5	-1.74319	2.51172	2.18567	-3.59958	-1.74399	1.375	1.375
2017	6	1.24908	-0.7601	0.418945	1.96387	0.155518	-1.05286	-1.05286
2017	7	1.91245	1.37003	0.184265	1.10739	0.963074	-0.32221	-0.32221
2017	8	0.255219	2.14908	1.34726	0.373383	-0.65933	1.87686	1.87686
2017	9	1.22363	-0.63367	1.23535	1.3819	1.96149	1.97198	1.97198
2017	10	2.3938	1.04544	1.53601	0.789795	-0.27875	4.65454	4.65454

2017	11	-2.92E-02	0.932251	3.53561	1.02478	-1.70065	1.99158	1.99158
2017	12	0.993561	0.574219	-2.88055	5.22159	-1.30646	1.80222	1.80222
2018	1	1.07E-01	-0.93109	7.35052	0.546753	-3.73E-02	7.11719	7.11719
2018	2	2.30206	1.62885	2.30048	0.370697	0.154907	5.4725	5.4725
2018	3	-1.01984	2.42719	-0.37253	-1.86627	-0.7952	0.127045	0.127045
2018	4	2.34372	1.54431	-0.12128	0.708344	0.455566	3.94864	3.94864
2018	5	2.32382	-6.46E-02	-1.26764	4.19824	-0.92407	0.484314	0.484314
2018	6	-3.76E-02	2.99371	0.871246	4.33905	0.276398	1.32773	1.32773
2018	7	4.41E-02	4.48672	0.269562	-3.50653	1.8797	1.98059	1.98059
2018	8	-0.169769	-1.3208	0.522034	3.42419	0.966888	0.947571	0.947571
2018	9	5.47482	1.60974	0.749146	3.80981	0.52478	2.27777	2.27777
2018	10	3.5668	3.78064	2.5451	-0.56641	3.42856	-1.01974	-1.01974
2018	11	7.78E-01	0.117554	1.94519	1.42E-02	3.04E-02	2.36316	2.36316
2018	12	-2.85E+00	2.03052	-0.40045	-3.02094	-9.31E-02	0.238403	0.238403
2019	1	-1.28E-03	3.43472	4.98035	3.14185	2.78503	-3.84622	-3.84622
2019	2	0.565979	1.84204	4.39737	0.986694	0.496216	5.43671	5.43671
2019	3	-0.590637	4.56989	1.16287	-0.21277	0.743225	1.95074	1.95074
2019	4	0.450195	0.802307	0.701508	3.02713	0.326569	3.99295	3.99295
2019	5	-2.17798	-2.28079	0.399353	2.25394	1.00623	2.99741	2.99741
2019	6	-2.39621	3.10562	-0.16937	1.13696	-0.91269	4.08234	4.08234
2019	7	-1.24637	2.89713	0.20166	-1.50281	3.60669	2.3717	2.3717
2019	8	0.531616	1.5968	4.80E-02	1.711	1.22589	1.45096	1.45096
2019	9	-2.70688	2.22894	0.231537	-0.17761	-0.27103	3.90878	3.90878
2019	10	2.80E-01	1.63605	2.27551	5.34769	8.39E-02	-0.37454	-0.37454
2019	11	2.81E+00	4.38193	3.51239	-2.95172	-6.57E-02	-0.77625	-0.77625
2019	12	3.75378	2.11E-03	1.94565	3.07089	0.290558	-5.25458	-5.25458
2020	1	3.11673	2.5748	-4.52347	1.29565	-0.10226	-1.9631	-1.9631
2020	2	0.211487	3.18954	-1.74902	2.25519	-0.21741	2.07523	2.07523
2020	3	0.407135	3.46759	4.67117	-3.21005	0.118408	3.11523	3.11523
2020	4	-1.69479	-0.43619	3.02792	2.50644	0.423767	2.98865	2.98865
2020	5	1.62421	1.65042	2.33096	4.27673	0.477631	1.2326	1.2326
2020	6	-1.21872	2.20932	1.01154	-1.32385	-2.43451	2.19223	2.19223
2020	7	0.964935	-1.48618	2.58408	3.01666	0.884674	2.4971	2.4971
2020	8	4.02252	-0.30402	0.806641	1.79797	0.338989	2.69336	2.69336
2020	9	2.50613	-6.92E-02	2.14053	-0.2034	1.75787	2.76926	2.76926
2020	10	1.66599	2.30246	1.86661	-1.69662	2.57697	3.07855	3.07855
2020	11	1.53848	0.496155	3.00092	1.7088	1.55844	2.87637	2.87637
2020	12	-2.59003	0.50351	0.632141	-8.42E-02	-2.64944	2.83322	2.83322
2021	1	1.73373	-0.87509	-5.74316	-2.55746	2.57193	0.368591	0.368591
2021	2	1.13208	7.30E-02	-3.05371	-1.58652	-1.05151	4.65692	4.65692
2021	3	1.26764	0.999084	4.09695	-0.21146	1.22232	-0.89575	-0.89575
2021	4	0.347321	1.75662	3.49432	0.244324	1.24405	2.12003	2.12003
2021	5	0.849823	2.2233	2.61118	4.52353	1.82062	0.684692	0.684692
2021	6	4.01508	5.37262	1.09833	1.44266	1.33929	-1.29837	-1.29837
2021	7	0.821136	3.94812	1.31586	-1.83572	1.08908	2.35239	2.35239
2021	8	2.33081	5.32608	0.628845	0.379791	1.32608	2.75308	2.75308
2021	9	-0.310883	2.39813	-0.25226	2.5358	0.777985	2.59637	2.59637

2021	10	-0.659515	-1.15546	0.856201	1.70227	2.22717	1.68924	1.68924
2021	11	-0.248535	4.97034	1.10519	1.43637	-4.46176	1.82275	1.82275
2021	12	2.19437	3.32993	2.54236	4.39307	2.40207	3.23923	3.23923
2022	1	3.06754	0.887604	1.82443	5.33603	1.09534	9.08E-02	9.08E-02
2022	2	4.85889	-3.59277	5.20389	0.124176	-1.86121	2.948	2.948
2022	3	2.06393	-2.39801	4.84106	-0.23297	-0.5329	1.56274	1.56274
2022	4	7.71E-02	2.26971	2.94321	2.09485	1.83405	2.18304	2.18304
2022	5	-1.71E-01	9.74E-02	-0.40604	0.670929	-6.06E-02	3.2515	3.2515
2022	6	1.81229	-0.90378	-0.23068	-0.50696	-0.4711	3.15195	3.15195
2022	7	3.52686	2.38171	0.709656	3.18698	0.314697	3.9451	3.9451
2022	8	1.47891	2.90759	1.46826	-0.79562	0.707764	1.04767	1.04767
2022	9	1.68692	2.48785	1.48444	1.96609	0.82608	1.75598	1.75598
2022	10	-0.107208	-0.93924	2.6828	-0.21201	-1.86774	0.312836	0.312836
2022	11	0.547577	1.53564	0.417694	-1.23502	1.78613	-1.20203	-1.20203
2022	12	-0.746918	3.12802	1.28836	0.34137	7.98895	3.47372	3.47372
2023	1	2.78372	-0.92868	5.86703	4.74796	6.26553	4.2247	4.2247
2023	2	3.51288	1.16263	2.01089	-4.32431	3.48001	-1.2005	-1.2005
2023	3	3.39026	-0.7027	5.02737	1.84125	1.38321	2.79614	2.79614
2023	4	1.7984	2.43842	-1.8674	3.50153	3.24176	1.87915	1.87915
2023	5	2.09692	0.269623	-1.13754	2.65762	1.13004	0.249512	0.249512
2023	6	-1.11353	3.45782	-1.58847	6.16E-03	0.122101	3.18274	3.18274
2023	7	1.22983	2.6889	-0.55124	3.88528	-0.92331	-0.18231	-0.18231
2023	8	0.799316	-0.44843	2.56366	1.4491	0.781464	0.72406	0.72406
2023	9	2.95E+00	4.62485	1.79794	0.862488	7.23E-02	-2.12543	-2.12543
2023	10	3.74741	0.720245	4.13199	3.37878	0.218353	1.69846	1.69846
2023	11	1.89386	-0.58405	4.86789	3.56189	4.28864	2.66107	2.66107
2023	12	-1.29092	0.770721	2.13724	2.89438	0.408447	1.78531	1.78531
2024	1	-4.20E-02	0.10141	5.85175	0.542328	-5.48828	5.2366	5.2366
2024	2	0.689667	1.11624	1.85077	6.1041	0.480194	2.76682	2.76682
2024	3	0.839142	0.630188	4.27048	8.35605	-2.11807	-0.45505	-0.45505
2024	4	2.7966	2.8699	3.94891	-0.84787	1.56296	2.30392	2.30392
2024	5	2.57672	1.77393	-1.66135	2.20154	1.65561	1.43921	1.43921
2024	6	-0.238617	0.43692	-1.10526	-1.01315	-0.20389	2.21704	2.21704
2024	7	0.468933	2.44443	1.15088	0.647675	-1.36691	1.98419	1.98419
2024	8	0.690125	1.79819	0.331757	2.8472	-1.64331	2.03928	2.03928
2024	9	3.08252	0.549744	3.03464	2.07401	0.49939	0.548065	0.548065
2024	10	2.69629	5.15305	1.8446	0.297485	0.122253	2.63574	2.63574
2024	11	0.744171	-3.04477	-1.35901	0.304382	2.14383	4.93256	4.93256
2024	12	3.40686	1.64301	3.42694	-1.09271	1.77255	1.48801	1.48801
2025	1	0.295929	-1.64798	-1.78625	5.51276	3.56973	-0.948	-0.948
2025	2	-0.858917	2.61554	-0.10071	4.22458	0.361206	-1.38388	-1.38388
2025	3	-2.82324	2.96469	0.760864	4.12653	1.42032	1.89865	1.89865
2025	4	-1.38498	1.9599	0.923798	1.49823	-0.58795	3.37863	3.37863
2025	5	1.07532	4.4985	-0.96155	0.673218	-0.83197	3.34662	3.34662
2025	6	0.174866	6.49762	1.92664	-0.63916	-1.0256	3.42935	3.42935
2025	7	0.971039	2.66852	1.44537	4.00558	-0.92752	4.42661	4.42661
2025	8	1.28671	3.6069	2.70505	4.2511	-0.33041	2.67096	2.67096

2025	9	-0.245178	1.17114	1.87314	1.61942	0.770996	1.30508	1.30508
2025	10	-0.474792	2.61926	2.16519	2.13669	1.33347	2.48795	2.48795
2025	11	2.55576	1.52173	-1.72958	0.98349	2.49362	-0.18723	-0.18723
2025	12	0.30896	0.154602	-1.27414	0.697876	2.88626	-2.43439	-2.43439
2026	1	2.55804	0.383423	4.24844	3.41943	1.44113	3.19998	3.19998
2026	2	-2.05182	0.607239	0.400269	-3.5502	3.2106	0.121124	0.121124
2026	3	0.905457	4.5737	2.44055	-0.83966	-0.66229	2.62503	2.62503
2026	4	0.487823	2.9093	0.531799	-1.31857	1.15564	0.793732	0.793732
2026	5	-0.273193	2.81271	-1.07483	-1.77347	0.133911	1.09372	1.09372
2026	6	-1.26471	4.1929	8.00E-02	0.322449	0.908905	1.45255	1.45255
2026	7	-3.95E-01	4.526	0.868256	-1.42892	-9.78E-02	1.96118	1.96118
2026	8	2.29752	0.363281	0.527252	4.94559	-0.86823	2.22946	2.22946
2026	9	-0.308868	1.51465	-1.06296	3.41711	1.13858	4.41467	4.41467
2026	10	1.96991	2.73615	-1.01721	0.88147	-0.44565	-0.10284	-0.10284
2026	11	0.933777	3.02023	1.55899	1.84277	-0.76737	1.92297	1.92297
2026	12	1.53366	1.70963	-1.19855	4.41669	2.54895	2.14273	2.14273
2027	1	2.42224	4.27542	3.03094	-2.80975	0.910919	4.82358	4.82358
2027	2	2.25146	-0.71536	8.05609	0.798004	-0.90768	3.0423	3.0423
2027	3	1.44934	1.36008	1.31598	-1.99475	0.396912	3.13464	3.13464
2027	4	0.475922	3.43991	1.3645	-0.19006	3.45596	3.28354	3.28354
2027	5	2.8028	4.8703	1.93848	-0.64087	0.398834	1.409	1.409
2027	6	1.32468	3.6687	-0.11707	1.42136	-1.4856	3.10342	3.10342
2027	7	5.10715	6.1127	0.670776	3.46469	5.16937	3.4931	3.4931
2027	8	4.21591	3.81567	1.57684	1.97177	3.99368	3.12576	3.12576
2027	9	5.12894	2.98294	8.44E-02	5.03601	1.94308	2.67456	2.67456
2027	10	2.7355	2.89114	2.3718	-0.3363	-0.56964	4.84354	4.84354
2027	11	1.89758	4.62375	2.19452	-1.47263	0.755219	5.36606	5.36606
2027	12	2.84479	1.66391	5.15085	0.321289	1.09116	1.56882	1.56882
2028	1	-5.91357	2.4382	2.78473	-4.75314	-0.78818	7.82788	7.82788
2028	2	-3.00113	0.977631	1.52377	2.0145	3.54391	0.9841	0.9841
2028	3	0.488556	2.2496	3.15778	3.70374	2.79242	2.53394	2.53394
2028	4	0.177521	1.5697	0.514221	-4.68817	1.84247	3.67593	3.67593
2028	5	2.4733	2.72601	0.819061	-1.72226	2.98502	3.17749	3.17749
2028	6	0.694366	-1.4032	1.05603	4.98376	-1.79279	-0.93637	-0.93637
2028	7	0.294128	-2.8909	1.06256	0.405365	0.831879	2.1369	2.1369
2028	8	1.48523	1.36768	0.831055	-1.61682	-0.75934	2.66257	2.66257
2028	9	1.25562	3.57315	1.62555	-1.45801	0.856384	3.58289	3.58289
2028	10	1.6543	2.00385	-1.42899	0.347687	-1.88434	-0.23096	-0.23096
2028	11	3.69528	5.66E-02	2.72949	1.28058	0.475739	3.72995	3.72995
2028	12	0.969086	-0.9519	2.65555	2.28247	1.99866	1.47443	1.47443
2029	1	0.908325	1.60E-02	-4.98706	6.93893	-4.46716	1.90439	1.90439
2029	2	0.973663	3.86743	0.920166	2.66629	5.4758	-2.95529	-2.95529
2029	3	-2.04E+00	0.769897	3.27396	1.53555	-4.44E-02	-1.94147	-1.94147
2029	4	-1.3703	2.36502	1.26822	3.66824	1.78867	-1.43176	-1.43176
2029	5	2.5975	3.36572	3.42557	2.27194	0.155609	2.63062	2.63062
2029	6	4.85419	1.6369	2.43463	1.05045	1.5015	2.19363	2.19363
2029	7	4.83914	3.68951	4.79007	3.96298	1.86438	2.0737	2.0737

2029	8	6.43362	4.21198	2.76154	1.73709	-1.59714	3.54886	3.54886
2029	9	5.25443	1.70303	2.21594	2.35269	-0.11762	3.37186	3.37186
2029	10	5.63651	4.55975	3.37009	-2.40793	0.492371	6.53E-03	6.53E-03
2029	11	1.24707	4.16254	2.71631	0.171692	0.590546	1.44815	1.44815
2029	12	2.60E+00	-1.4169	0.947754	3.32407	2.01E-02	2.93753	2.93753
2030	1	2.51434	2.82132	3.13113	1.37875	0.399841	2.5332	2.5332
2030	2	2.85599	1.97525	1.96237	2.83881	1.1369	2.97681	2.97681
2030	3	2.55695	1.4581	-4.31473	5.80573	1.4534	0.817047	0.817047
2030	4	3.31421	1.22592	0.985413	2.71155	0.541748	3.62775	3.62775
2030	5	3.056	1.40002	-9.18E-02	-0.27066	1.97702	-9.14E-02	-9.14E-02
2030	6	2.21277	-0.64948	1.38962	0.79306	0.138	2.09274	2.09274
2030	7	1.18845	1.88101	0.714355	3.11337	-0.34543	3.74359	3.74359
2030	8	0.554932	2.48257	0.693939	2.95349	0.174866	1.40247	1.40247
2030	9	2.06332	2.80203	0.946136	1.48389	2.89789	4.05157	4.05157
2030	10	2.09119	2.00095	0.530609	0.813293	1.94388	1.42755	1.42755
2030	11	1.89697	2.22995	-0.17789	1.38409	-0.40726	2.40848	2.40848
2030	12	1.98056	1.6571	4.18823	0.722473	0.41156	4.07101	4.07101
2031	1	3.08554	0.582123	1.65665	3.11584	-0.64896	7.19608	7.19608
2031	2	0.996979	0.490448	-1.98273	4.10898	-1.81711	4.33643	4.33643
2031	3	4.06735	1.07959	3.08627	-0.29077	-1.21017	4.65213	4.65213
2031	4	0.218597	0.73822	2.20682	-1.42465	-2.68463	3.05243	3.05243
2031	5	-0.450806	4.47E-02	1.97116	0.489532	0.790222	2.74E-02	2.74E-02
2031	6	0.320892	2.4657	1.65063	2.63416	0.305511	0.412048	0.412048
2031	7	-0.140472	1.8815	3.12177	0.901489	0.289185	0.959198	0.959198
2031	8	-0.468079	4.41919	2.23874	1.2428	1.97958	1.35077	1.35077
2031	9	1.59653	3.12766	2.31094	4.55109	-1.87003	4.38046	4.38046
2031	10	1.8157	1.36176	0.834412	-2.177	-0.47635	2.01263	2.01263
2031	11	1.10037	5.06046	0.446808	1.7403	0.487732	3.43896	3.43896
2031	12	1.16309	1.33212	2.95804	6.21127	0.817963	5.27921	5.27921
2032	1	3.44052	2.9317	0.220825	6.93134	-2.24866	8.27988	8.27988
2032	2	4.96E-02	3.27213	-1.73441	1.9993	0.785614	3.78491	3.78491
2032	3	2.19315	0.819702	3.75797	5.79944	-0.93887	2.14944	2.14944
2032	4	3.9639	1.05231	2.22733	2.21494	1.17615	0.921539	0.921539
2032	5	-0.309906	2.56992	1.81006	2.98505	1.01813	2.5076	2.5076
2032	6	3.17679	-0.4017	-6.14E-02	-1.61255	1.93109	3.71243	3.71243
2032	7	0.898041	0.107422	0.482056	2.55856	3.68307	2.1441	2.1441
2032	8	4.05252	-0.26382	2.09015	-0.51242	0.869385	3.48856	3.48856
2032	9	5.39203	-1.56265	3.31674	1.74979	2.74408	3.42398	3.42398
2032	10	0.656189	-0.94656	3.63831	3.98959	0.920959	2.52356	2.52356
2032	11	1.92267	-0.89865	6.1918	1.75589	-3.03827	-0.24484	-0.24484
2032	12	1.45947	-0.5011	0.606934	3.40018	0.703064	5.30301	5.30301
2033	1	2.38272	2.16702	0.316132	3.44595	-2.21936	3.6543	3.6543
2033	2	0.295471	4.06564	-0.18753	0.281281	3.43869	0.2771	0.2771
2033	3	2.00815	2.99509	3.42776	2.48343	0.679108	-0.70575	-0.70575
2033	4	3.44391	-9.30E-02	0.320618	4.92163	2.08014	-1.47968	-1.47968
2033	5	-1.38608	2.08862	4.26868	2.73813	-0.63068	3.5369	3.5369
2033	6	0.42218	2.1752	4.02155	-3.01404	-2.10059	1.65485	1.65485

2033	7	0.520355	1.98E-02	5.09036	-2.91531	-0.5289	0.539886	0.539886
2033	8	0.14151	6.13718	3.57846	1.84079	-1.18732	2.46878	2.46878
2033	9	2.46701	6.46185	4.81775	1.55359	0.120483	2.87418	2.87418
2033	10	3.1282	2.64926	2.0795	3.8649	1.65616	3.41724	3.41724
2033	11	1.68747	4.36646	3.6171	4.41409	2.37753	2.56717	2.56717
2033	12	5.44516	1.5235	1.42734	3.71948	2.43427	-1.97119	-1.97119
2034	1	5.21E+00	0.903198	8.80634	6.31494	2.94E-02	4.21179	4.21179
2034	2	4.10916	1.81253	1.08197	5.4852	0.398895	1.07211	1.07211
2034	3	2.40594	3.93127	6.16437	4.26895	1.9978	-1.83084	-1.83084
2034	4	-0.99588	5.28751	2.1373	-5.36E-02	1.53195	2.41144	2.41144
2034	5	-0.291992	1.58542	2.17645	0.469727	1.72504	3.75601	3.75601
2034	6	-1.82361	-0.28748	5.41382	0.605865	1.13062	2.39764	2.39764
2034	7	-0.361755	3.31122	5.51828	1.49167	1.82709	1.84729	1.84729
2034	8	0.53302	3.93307	3.63583	3.14398	3.08038	-0.69074	-0.69074
2034	9	9.46E-01	7.51883	6.84824	5.8241	3.59E-02	-0.18222	-0.18222
2034	10	2.20221	1.41766	3.57709	0.999695	1.74557	5.10724	5.10724
2034	11	1.94336	2.57413	1.14011	-1.40472	-0.79416	3.77457	3.77457
2034	12	6.20987	2.40302	2.49673	0.385681	0.27417	-0.42157	-0.42157
2035	1	1.31564	-0.18958	3.01224	3.42334	-1.51178	-1.88251	-1.88251
2035	2	1.22739	0.602936	5.33008	-0.3736	-0.81479	-3.52628	-3.52628
2035	3	-0.871643	2.4274	1.56216	3.92834	-0.62509	-0.89847	-0.89847
2035	4	0.180023	2.32022	-3.42E-02	4.18704	0.636353	1.05573	1.05573
2035	5	-1.21899	4.01361	2.98785	1.37823	1.11401	3.74512	3.74512
2035	6	2.25467	3.2016	3.49823	2.78085	0.782715	-0.88605	-0.88605
2035	7	1.50494	6.00931	3.02307	3.43887	2.8031	1.9653	1.9653
2035	8	4.18771	3.63959	0.99295	3.4704	1.60388	2.81985	2.81985
2035	9	5.07E-01	3.99945	2.61053	1.1973	8.58E-02	4.83456	4.83456
2035	10	-0.764404	4.53235	-1.7966	1.58228	-1.78973	3.20105	3.20105
2035	11	2.74527	1.54105	1.867	-0.20581	-0.36566	3.58975	3.58975
2035	12	2.27536	3.32312	-0.47327	5.41559	0.854462	6.13492	6.13492
2036	1	1.55652	2.37152	3.28574	5.56433	1.29254	10.9647	10.9647
2036	2	5.64978	1.10785	2.63849	2.8208	2.18399	3.828	3.828
2036	3	4.28094	2.23679	4.78497	1.07812	1.05823	3.33185	3.33185
2036	4	3.4436	-0.8631	4.84232	0.424927	2.81256	2.77475	2.77475
2036	5	2.19162	0.825317	2.88675	3.49445	0.840637	3.465	3.465
2036	6	4.63696	1.63141	5.87704	0.797668	-0.60651	4.62762	4.62762
2036	7	2.44763	0.777802	5.06436	0.763092	0.603271	5.09048	5.09048
2036	8	4.29092	3.16299	5.42255	2.76587	0.342773	4.67456	4.67456
2036	9	0.449829	4.03714	1.20114	2.69809	-0.71143	8.47067	8.47067
2036	10	-0.524597	0.616058	4.1535	3.16687	0.833557	6.05725	6.05725
2036	11	-0.282532	4.37405	2.1842	4.4368	0.838623	5.10785	5.10785
2036	12	1.83508	2.09351	2.46475	-0.90143	0.117554	-1.08878	-1.08878
2037	1	-2.17368	3.93771	-4.42615	5.00046	5.26193	3.81927	3.81927
2037	2	0.947083	1.98325	-4.29391	0.509491	1.19791	2.35962	2.35962
2037	3	0.80014	5.43689	3.53366	0.470245	-0.53	2.04733	2.04733
2037	4	3.36481	2.34592	1.49142	3.02933	-1.06345	-0.56186	-0.56186
2037	5	1.61752	1.4122	0.979675	3.09772	2.99673	-0.15451	-0.15451

2037	6	0.332367	-0.2301	2.37692	-7.32E-02	2.23819	2.63153	2.63153
2037	7	0.345032	1.59402	4.31638	2.02448	2.60318	2.42319	2.42319
2037	8	2.70163	1.30789	3.84204	-0.74802	1.72437	1.62067	1.62067
2037	9	2.41003	4.09094	1.64304	3.14362	4.19269	2.54208	2.54208
2037	10	1.76941	1.69995	4.89511	0.414795	1.00986	3.38113	3.38113
2037	11	0.531464	1.89233	4.75861	0.610596	1.94244	5.63547	5.63547
2037	12	1.89E+00	1.98862	4.26193	1.85806	4.06E-03	3.37683	3.37683
2038	1	4.60864	-0.17059	1.10925	2.18524	-0.35947	2.86639	2.86639
2038	2	4.03748	5.59583	4.44958	-3.14142	-2.936	2.18073	2.18073
2038	3	3.79346	1.92477	4.49628	5.77994	-0.62338	3.61273	3.61273
2038	4	2.2995	2.49081	3.87131	-1.68686	1.55716	2.96844	2.96844
2038	5	1.69931	2.30392	2.07648	0.79953	1.73322	0.438507	0.438507
2038	6	1.25037	3.2337	0.849823	-0.65274	1.71271	3.22974	3.22974
2038	7	1.90695	4.28622	1.16776	-4.73E-02	2.68329	3.15689	3.15689
2038	8	1.64713	1.17999	3.31125	-0.16522	0.425964	2.17065	2.17065
2038	9	8.00323	0.448639	-6.99E-02	1.7114	-1.0018	2.71118	2.71118
2038	10	0.92041	3.90353	2.3295	1.21487	1.81625	2.24146	2.24146
2038	11	3.11948	2.65933	2.88E-02	1.10468	0.16452	1.01965	1.01965
2038	12	3.20428	1.66562	3.01526	4.09177	0.877869	3.54782	3.54782
2039	1	1.24533	3.2457	4.21713	5.63434	-1.45355	4.92099	4.92099
2039	2	-0.99704	2.09665	-0.28503	1.98E-02	1.07462	3.6275	3.6275
2039	3	0.101654	5.19E-02	3.07596	3.57925	1.91953	3.66956	3.66956
2039	4	1.31	-0.20749	2.68842	2.49524	1.99466	2.40775	2.40775
2039	5	1.24002	-2.42319	0.684174	1.05203	0.331726	1.16299	1.16299
2039	6	2.62338	-2.31229	3.01492	2.85535	-0.89731	2.15225	2.15225
2039	7	3.82693	-0.73578	3.79416	0.444183	-1.89441	2.4953	2.4953
2039	8	3.41821	2.58759	4.69565	0.674469	0.948486	2.98087	2.98087
2039	9	1.61124	3.73465	-9.74E-02	3.1308	-0.65402	2.70346	2.70346
2039	10	-3.23E-02	1.75195	5.5065	1.11938	0.352173	4.43436	4.43436
2039	11	0.526978	2.48373	4.08582	3.3985	0.593536	2.11456	2.11456
2039	12	2.63718	2.22211	5.69174	4.51208	1.64764	3.94672	3.94672
2040	1	-0.115082	5.28452	0.499847	4.57123	2.01923	3.96558	3.96558
2040	2	3.48648	4.53894	-0.19363	3.83969	1.37772	-1.30209	-1.30209
2040	3	0.378052	3.5983	-0.24295	7.96185	1.0921	0.44046	0.44046
2040	4	2.58521	0.798126	2.7785	-0.32736	2.03085	0.211151	0.211151
2040	5	2.43701	2.05072	2.74225	-1.44366	0.128937	2.90491	2.90491
2040	6	3.09909	1.04861	3.25812	-2.63025	0.788208	4.02295	4.02295
2040	7	3.07056	1.15701	3.39017	5.55E-02	1.13779	3.4003	3.4003
2040	8	4.13412	-1.4996	4.32294	-0.9989	1.00677	2.53287	2.53287
2040	9	2.99753	0.395935	2.16776	1.15521	1.41129	4.76526	4.76526
2040	10	1.07779	2.65485	3.6011	-0.94751	0.973053	2.87985	2.87985
2040	11	-1.02582	5.18793	5.80801	0.608093	0.274231	2.47318	2.47318
2040	12	2.12338	1.1337	2.62955	1.23059	-2.73285	4.69873	4.69873
2041	1	3.88333	1.73212	-2.18005	4.36826	2.09344	4.61859	4.61859
2041	2	-3.30551	3.81903	-4.34311	-0.9484	1.62131	0.991608	0.991608
2041	3	-0.677155	-0.97141	2.65796	3.08273	2.76562	3.71396	3.71396
2041	4	3.81281	1.66602	3.1149	7.62E-02	0.738739	2.33475	2.33475

2041	5	2.2887	0.809509	6.91E-02	3.87454	3.27951	3.47641	3.47641
2041	6	2.04117	-9.64E-02	2.48962	-0.21454	4.25699	3.84424	3.84424
2041	7	1.99564	4.74252	2.95068	2.90479	2.2652	2.2775	2.2775
2041	8	4.02231	5.5043	1.43884	4.02768	2.42859	3.48117	3.48117
2041	9	3.66501	0.429535	-0.57755	2.84021	3.3248	6.04697	6.04697
2041	10	2.98621	3.28503	-1.612	3.62979	3.77338	2.95456	2.95456
2041	11	3.39368	1.79953	2.50299	0.676483	1.95804	1.67105	1.67105
2041	12	-0.18454	-0.31018	3.35925	4.83429	0.627563	1.47272	1.47272
2042	1	-2.78757	2.26221	-0.85385	4.16904	3.82373	4.85068	4.85068
2042	2	-1.83041	2.75653	3.59549	2.4917	3.1142	5.4407	5.4407
2042	3	6.56E-02	2.5838	2.26047	2.27744	-2.79E-02	-2.41586	-2.41586
2042	4	0.908112	-1.6225	1.4408	-5.07886	1.53726	3.52405	3.52405
2042	5	0.305695	3.1799	1.11276	-1.83466	1.92941	4.4386	4.4386
2042	6	2.62936	4.55371	1.99265	-1.70663	1.13351	2.18045	2.18045
2042	7	5.38614	4.2565	4.80328	1.29578	1.80759	2.61249	2.61249
2042	8	3.69281	1.48428	3.39276	4.89819	2.54617	2.12497	2.12497
2042	9	2.88943	4.11954	4.55093	2.32401	0.804077	0.53418	0.53418
2042	10	1.08499	3.41885	2.64709	0.992676	3.76025	2.97525	2.97525
2042	11	5.13187	0.413147	8.35E-02	1.31857	1.94604	0.296051	0.296051
2042	12	3.32516	-0.9415	0.783936	3.78159	3.83197	3.38522	3.38522
2043	1	3.17804	2.35962	0.262848	2.12186	-3.05228	-0.87531	-0.87531
2043	2	3.36127	4.95074	2.42349	1.10358	1.03149	2.02472	2.02472
2043	3	-8.94E-03	-2.56	4.67038	1.54883	-0.1536	4.11954	4.11954
2043	4	2.16382	1.84402	1.26651	1.14914	0.837158	1.35074	1.35074
2043	5	4.95941	0.138	0.938354	0.824738	0.50592	2.06302	2.06302
2043	6	1.61877	1.97711	2.32272	2.12274	0.541595	2.35724	2.35724
2043	7	2.28793	0.105316	1.25146	-0.33884	2.7554	2.2868	2.2868
2043	8	3.83932	4.1279	0.338348	2.077	2.20718	4.10617	4.10617
2043	9	6.08142	1.65564	1.43906	0.923004	3.29837	1.71277	1.71277
2043	10	3.38989	0.918549	3.04141	-0.69421	0.897949	1.12524	1.12524
2043	11	5.13828	4.65735	-0.84851	0.947174	1.21692	2.46817	2.46817
2043	12	3.31836	2.9751	1.62445	2.18259	1.17236	2.65042	2.65042
2044	1	0.914948	-0.2897	0.331848	7.30313	4.42023	6.6394	6.6394
2044	2	1.08096	-5.08206	0.892273	1.4675	-0.4194	7.00983	7.00983
2044	3	3.19675	3.8425	4.62866	1.50574	1.32532	3.83774	3.83774
2044	4	3.76151	4.07861	1.3349	-0.53226	1.57034	1.94455	1.94455
2044	5	2.65469	3.39102	1.57547	0.924438	2.29483	2.03101	2.03101
2044	6	3.50388	5.89291	2.29254	-0.53604	-0.40021	3.79922	3.79922
2044	7	4.07645	5.56873	2.57758	1.68137	-0.233	3.9519	3.9519
2044	8	3.97751	4.36478	4.21466	5.39148	-0.61273	2.55548	2.55548
2044	9	3.26193	3.04166	2.76083	4.2403	0.25	2.24307	2.24307
2044	10	3.91998	3.48886	1.86819	4.11508	0.345459	2.21555	2.21555
2044	11	2.75607	2.77545	0.3125	1.59149	2.41083	2.71817	2.71817
2044	12	2.81506	2.0239	3.19525	4.22018	3.72055	1.46091	1.46091
2045	1	2.24265	1.27811	3.15704	10.5939	2.62415	8.65649	8.65649
2045	2	3.54568	3.00925	5.79297	2.608	3.6467	1.91901	1.91901
2045	3	2.37643	4.83228	2.99286	0.851654	2.61133	2.09485	2.09485

2045	4	2.12891	2.36783	1.7796	1.27863	-0.28116	1.70715	1.70715
2045	5	4.34982	1.9819	0.285767	0.426422	0.300415	1.77151	1.77151
2045	6	3.09827	3.70212	0.816345	0.691864	2.65961	4.59393	4.59393
2045	7	6.24475	3.77402	0.645477	4.06009	4.77267	5.76508	5.76508
2045	8	2.57422	3.302	2.58264	3.34317	3.57309	3.94116	3.94116
2045	9	0.146637	1.02524	3.73416	2.491	0.80307	2.40637	2.40637
2045	10	0.45108	-2.95004	3.70209	4.09338	1.34186	3.07803	3.07803
2045	11	2.63837	3.35324	2.30371	1.40479	4.64764	1.50458	1.50458
2045	12	6.47348	1.9798	2.88016	-0.11801	-3.59433	2.56912	2.56912
2046	1	4.38464	3.80261	1.32715	4.07663	2.36172	7.3244	7.3244
2046	2	2.58289	3.33572	-3.03363	-1.07159	-4.55481	1.10291	1.10291
2046	3	1.55676	-1.00711	1.68896	2.43954	2.8963	6.25125	6.25125
2046	4	2.29712	2.5083	3.24011	4.31314	3.11365	2.25473	2.25473
2046	5	1.8378	2.25131	4.38977	-0.54327	0.266815	1.117	1.117
2046	6	1.23587	4.49921	2.83273	-2.28864	1.58569	3.68903	3.68903
2046	7	2.37503	2.88281	6.31778	4.43356	2.83499	1.90829	1.90829
2046	8	4.03802	1.77899	5.19534	2.76468	4.21677	1.86536	1.86536
2046	9	1.58002	1.94943	2.29065	3.7117	1.05618	2.05658	2.05658
2046	10	1.18289	2.24014	2.12619	2.19589	-0.41025	3.55255	3.55255
2046	11	2.59888	3.93753	1.01529	3.98257	-0.52988	2.85416	2.85416
2046	12	0.977478	4.53732	2.91675	7.32327	0.577545	3.4317	3.4317
2047	1	1.75024	0.411499	2.23203	1.34244	-2.50656	0.944183	0.944183
2047	2	7.85E-01	1.68085	3.43637	2.86328	-3.95E-02	-3.91E-02	-3.91E-02
2047	3	-5.62E-02	1.77E-02	2.13287	2.68484	-1.33398	4.08594	4.08594
2047	4	2.50232	-1.577	0.436707	3.49664	0.175964	4.69165	4.69165
2047	5	3.68182	2.19012	2.52115	2.58405	1.31232	1.86679	1.86679
2047	6	1.46048	0.790924	4.18692	6.56894	0.395813	5.15353	5.15353
2047	7	5.66776	1.03741	7.25089	1.01767	5.92468	5.25058	5.25058
2047	8	5.55212	1.19089	4.11325	5.07077	5.44147	3.98987	3.98987
2047	9	2.85242	3.95053	3.47433	4.55881	1.66397	4.38327	4.38327
2047	10	2.68188	2.19205	5.32779	1.63577	-0.51633	6.72824	6.72824
2047	11	2.69598	2.78824	4.93011	0.219086	-0.81906	2.35867	2.35867
2047	12	2.91217	0.329498	1.39294	2.73846	1.81256	4.53763	4.53763
2048	1	5.56253	-1.6257	-2.19196	8.04965	-1.88635	-2.13031	-2.13031
2048	2	4.23499	-0.25348	3.62399	-0.27252	3.68991	-2.1994	-2.1994
2048	3	1.88895	1.93439	4.24408	2.59064	0.475403	0.471436	0.471436
2048	4	4.40982	2.16232	2.2836	1.76633	3.07477	2.80325	2.80325
2048	5	3.3031	3.2164	0.330963	4.32254	-0.31998	3.33871	3.33871
2048	6	3.54459	2.17651	0.92804	2.64645	0.750793	4.52563	4.52563
2048	7	2.87433	-1.03799	2.20886	5.82089	-0.28391	4.5029	4.5029
2048	8	2.99631	-0.2756	3.90546	4.98648	3.31738	5.81836	5.81836
2048	9	6.57263	1.05194	4.63266	3.81491	0.992096	4.99118	4.99118
2048	10	2.74701	1.94214	1.10571	1.44748	3.25278	4.87015	4.87015
2048	11	-0.302216	1.82495	1.586	1.41238	1.95474	3.05008	3.05008
2048	12	0.757568	2.28802	2.12494	3.38339	-1.07513	-2.43008	-2.43008
2049	1	3.68594	2.4021	2.39423	2.03204	-3.18506	3.4505	3.4505
2049	2	2.59818	5.69803	4.53659	7.5795	3.233	2.9494	2.9494

2049	3	0.404358	1.22028	3.35577	4.00085	-0.63599	2.07404	2.07404
2049	4	3.72E+00	-8.48E-02	1.56772	4.79535	2.87E-02	1.55154	1.55154
2049	5	2.92041	0.801025	2.65515	0.350342	1.43091	2.41391	2.41391
2049	6	2.64038	6.84E-02	6.24344	3.20627	1.65469	2.58594	2.58594
2049	7	4.69943	1.85193	7.33057	4.56079	1.02087	4.81009	4.81009
2049	8	5.36523	1.74899	4.96866	1.33389	-2.91983	3.70358	3.70358
2049	9	3.95862	0.613831	5.07755	3.0134	-1.94061	0.592072	0.592072
2049	10	1.51981	4.49234	1.72791	4.7168	1.20767	3.35834	3.35834
2049	11	2.05508	2.29123	3.0925	2.76727	-1.32986	7.19516	7.19516
2049	12	1.46619	2.90582	3.42795	-0.73773	2.64606	2.80301	2.80301
2050	1	3.03732	3.0686	2.74475	-2.40387	-0.94208	5.22818	5.22818
2050	2	3.85547	4.81784	8.80948	-3.28192	2.19699	1.25781	1.25781
2050	3	4.20013	2.35538	8.10547	3.53143	3.29861	1.76373	1.76373
2050	4	4.10382	2.401	2.24261	7.49033	3.92514	-0.86716	-0.86716
2050	5	3.42291	2.2312	1.50195	5.01273	1.65143	5.08929	5.08929
2050	6	2.08517	1.83911	2.14532	4.06714	1.5639	3.15515	3.15515
2050	7	5.90726	2.68301	4.51706	0.890778	2.56277	3.1489	3.1489
2050	8	6.22131	5.79538	2.91266	0.593079	1.37997	4.63797	4.63797
2050	9	2.33261	5.74216	2.30524	2.76251	1.95889	6.34317	6.34317
2050	10	6.9642	5.37735	2.26529	3.04437	2.12238	7.96024	7.96024
2050	11	1.53848	3.99445	5.86191	3.4097	1.30374	2.83347	2.83347
2050	12	2.53809	3.48471	1.46744	2.40967	-0.36105	1.58841	1.58841
2051	1	5.01993	2.0177	-0.83716	1.28085	-0.69577	-3.84E-02	-3.84E-02
2051	2	1.29678	-0.74887	2.52917	-2.6037	2.25211	0.6026	0.6026
2051	3	3.37756	4.75519	1.65497	5.76993	1.65341	4.13525	4.13525
2051	4	4.2222	3.5527	2.12131	2.73492	1.09537	5.16644	5.16644
2051	5	4.70599	5.58572	-0.77155	5.02094	3.02582	4.00562	4.00562
2051	6	5.28079	1.44241	2.83383	2.04486	2.8392	2.96323	2.96323
2051	7	8.00015	3.27823	2.84946	0.614685	3.27368	2.8826	2.8826
2051	8	7.09692	5.45538	3.52286	1.14429	-0.84851	4.75217	4.75217
2051	9	8.34653	3.79526	4.33954	2.7695	-1.77643	5.64017	5.64017
2051	10	0.316986	3.72064	4.4928	4.91409	-0.55273	5.05954	5.05954
2051	11	3.47748	0.438232	1.08401	4.5	3.27414	3.94165	3.94165
2051	12	3.11127	2.05652	2.30554	-1.73141	-1.27963	6.77472	6.77472
2052	1	6.18802	4.58521	-0.65765	-0.48724	1.56165	4.4968	4.4968
2052	2	1.42038	1.96524	-2.61053	-0.90302	1.98871	4.30261	4.30261
2052	3	6.34586	0.693085	-2.16174	1.36624	0.422729	4.49155	4.49155
2052	4	3.45871	2.48621	1.39E-02	-0.49905	1.37805	2.84384	2.84384
2052	5	2.87289	5.15222	4.29495	2.36462	1.96674	3.1929	3.1929
2052	6	1.85059	1.55942	-0.34387	0.78775	4.04129	3.39505	3.39505
2052	7	5.11536	4.6586	1.57126	0.537567	3.12939	4.8194	4.8194
2052	8	3.59482	5.82928	1.89746	4.26059	1.40057	2.26007	2.26007
2052	9	6.17642	3.86575	1.62384	4.73221	0.34549	2.50089	2.50089
2052	10	2.48428	2.50565	2.5134	1.71368	-2.05573	3.13995	3.13995
2052	11	0.462067	3.50494	2.54199	-1.1893	0.918243	3.79767	3.79767
2052	12	4.78027	5.1861	3.01416	4.78067	1.33984	4.67371	4.67371
2053	1	3.37512	2.67532	1.63223	2.04883	-0.19867	2.32648	2.32648

2053	2	3.62659	4.21362	1.75558	4.7251	-1.22391	6.07822	6.07822
2053	3	-0.623138	3.37018	2.65057	1.59225	-3.01437	1.71436	1.71436
2053	4	4.23032	4.4086	2.59592	-0.78137	-0.35126	3.68823	3.68823
2053	5	2.95471	3.2272	1.81757	-0.95398	3.26871	2.1452	2.1452
2053	6	5.62549	0.759796	3.04352	4.77304	1.866	3.77753	3.77753
2053	7	3.86023	4.4971	5.10187	3.36908	1.05978	4.13129	4.13129
2053	8	5.84872	1.09409	4.70206	3.37778	2.21027	4.69058	4.69058
2053	9	6.53754	4.90555	3.97794	3.61209	-0.45941	5.74008	5.74008
2053	10	5.72E+00	3.35904	4.48199	0.656982	3.54E-02	5.83896	5.83896
2053	11	1.99957	5.00464	5.40149	0.609497	1.61533	2.55167	2.55167
2053	12	3.01389	0.652618	3.45755	1.90628	2.64514	2.93552	2.93552
2054	1	4.87024	2.30942	5.27094	4.08655	0.86203	7.0029	7.0029
2054	2	-1.11484	3.12265	-1.18253	2.11169	-0.2381	0.532898	0.532898
2054	3	0.261139	1.2695	-1.36615	3.98474	2.61771	-2.37326	-2.37326
2054	4	3.57E+00	3.681	1.3717	2.11975	1.52E-02	-0.10535	-0.10535
2054	5	4.09811	5.50101	5.92746	3.15723	2.72333	1.44382	1.44382
2054	6	2.29489	2.15521	1.72162	4.02255	0.52121	4.64343	4.64343
2054	7	1.10193	2.0802	4.80597	1.89847	1.07379	3.9028	3.9028
2054	8	5.08414	4.3858	5.32266	3.8111	1.96518	3.65918	3.65918
2054	9	7.72302	3.73184	3.64883	5.77921	4.0842	3.32666	3.32666
2054	10	3.93921	4.37134	4.80359	4.2739	0.859772	2.84283	2.84283
2054	11	4.18658	-1.28867	2.68051	-1.76901	1.20764	5.89505	5.89505
2054	12	2.83566	3.1333	-0.10886	4.67349	-0.29816	5.31772	5.31772
2055	1	3.07684	3.13492	-0.30267	4.71753	-1.73907	7.42349	7.42349
2055	2	0.647461	2.25885	-3.76413	0.388306	-0.57111	8.4718	8.4718
2055	3	-1.00E+00	2.10159	-0.16745	0.755341	-4.55E-02	3.50925	3.50925
2055	4	2.1087	3.58643	-0.5481	1.32614	-0.19104	4.17853	4.17853
2055	5	1.52951	2.72171	0.433075	3.04813	2.54111	3.94452	3.94452
2055	6	4.07867	1.6698	2.16403	2.70114	1.90421	3.67194	3.67194
2055	7	0.595032	2.5191	1.86469	4.32059	3.12018	4.28329	4.28329
2055	8	3.34003	4.16827	2.58896	2.66278	3.38797	4.71216	4.71216
2055	9	2.71243	2.22775	2.89145	3.52829	3.87708	7.82828	7.82828
2055	10	4.37698	-0.37344	6.4957	-1.68552	2.49365	2.27664	2.27664
2055	11	2.48358	0.552856	3.06021	5.13538	1.39413	4.08725	4.08725
2055	12	6.10306	2.8822	-0.44705	3.62769	3.09744	7.37653	7.37653
2056	1	5.48654	-0.73688	6.31604	9.38306	4.77634	4.58929	4.58929
2056	2	-0.319336	-0.38477	-0.92111	4.5878	-0.31479	3.612	3.612
2056	3	1.12296	2.6265	3.53625	-0.75147	0.799225	5.70554	5.70554
2056	4	1.5842	-3.26E-02	1.03482	0.17804	-1.93283	2.73953	2.73953
2056	5	4.34412	4.64941	2.54306	0.956543	2.80301	3.21899	3.21899
2056	6	4.05838	2.41122	1.25723	1.35715	0.69281	2.91025	2.91025
2056	7	3.95786	2.41092	3.04678	1.12909	3.96799	3.85739	3.85739
2056	8	4.16623	3.83618	3.57736	3.31088	0.875885	3.65027	3.65027
2056	9	2.60812	0.24823	2.18616	4.53922	1.96179	5.17068	5.17068
2056	10	4.0997	2.53784	0.643188	0.325195	-0.90002	2.60803	2.60803
2056	11	1.22406	0.273651	1.86731	4.58618	2.84003	2.11877	2.11877
2056	12	6.06168	1.1312	-1.14764	1.50488	-2.48584	5.75153	5.75153

2057	1	2.73172	1.34012	7.84143	6.97763	0.881042	4.42599	4.42599
2057	2	1.33438	4.04272	4.12598	3.30521	0.533813	4.51752	4.51752
2057	3	1.51715	-4.88E-02	3.10587	3.52435	1.6279	-0.37656	-0.37656
2057	4	2.22891	2.84802	2.63123	2.01685	0.88266	3.29272	3.29272
2057	5	2.629	2.5816	0.283478	1.20224	0.729034	5.3316	5.3316
2057	6	5.11398	4.9751	2.88644	2.66656	-0.43561	2.13715	2.13715
2057	7	3.91513	0.849823	4.07126	2.99927	0.456879	3.17209	3.17209
2057	8	3.48532	3.32419	2.29294	6.97879	3.70758	4.57626	4.57626
2057	9	4.49823	7.56454	0.900543	4.08209	1.59549	3.45956	3.45956
2057	10	2.03629	4.79355	3.07971	1.4386	0.385376	4.89896	4.89896
2057	11	4.18347	0.703552	3.97119	5.72318	0.974121	1.68826	1.68826
2057	12	3.06757	3.186	0.790436	-0.51044	4.35617	6.47733	6.47733
2058	1	2.79865	0.522522	-0.30505	4.61475	3.86713	5.6264	5.6264
2058	2	4.92938	3.59332	2.70737	3.5415	4.38409	1.11911	1.11911
2058	3	1.48514	4.5061	5.84308	3.12433	1.01941	3.23645	3.23645
2058	4	0.288422	5.63022	0.201416	1.10162	0.260345	2.30753	2.30753
2058	5	2.3782	6.35291	1.08136	3.79114	5.06561	3.10681	3.10681
2058	6	3.35547	5.55621	1.49933	6.13547	4.6055	2.55304	2.55304
2058	7	4.57944	3.71323	1.26096	6.31369	4.74878	1.58258	1.58258
2058	8	1.02423	5.91269	0.579651	2.37048	-0.81354	1.74496	1.74496
2058	9	0.280121	7.50113	2.61163	2.19421	0.596985	5.17908	5.17908
2058	10	4.88748	3.77765	4.11761	2.96237	3.11606	3.69434	3.69434
2058	11	3.67096	2.65793	3.37781	0.38208	0.663818	2.34778	2.34778
2058	12	2.82428	0.998016	1.22934	6.43378	0.272858	0.962708	0.962708
2059	1	4.06763	3.2197	5.30725	7.45593	-2.55838	1.42249	1.42249
2059	2	6.34E-02	3.52155	6.09549	4.72989	1.34369	7.28711	7.28711
2059	3	-0.305054	3.7912	1.10526	6.01715	0.342926	7.62354	7.62354
2059	4	0.175598	2.862	3.35141	4.22925	0.576447	4.04684	4.04684
2059	5	3.29791	3.73102	2.01187	3.70053	3.09534	4.52621	4.52621
2059	6	1.65018	4.03552	3.43802	1.21515	1.87289	2.93253	2.93253
2059	7	4.34705	1.65292	5.15817	-0.33911	3.24557	5.0932	5.0932
2059	8	3.34064	4.68768	3.99493	-0.10422	1.93298	4.75186	4.75186
2059	9	4.82092	4.30313	4.38394	0.961487	0.864288	5.69788	5.69788
2059	10	5.14288	3.85175	2.99091	0.128082	0.859375	5.33536	5.33536
2059	11	1.22357	4.20374	3.24442	1.71088	3.96094	5.74957	5.74957
2059	12	7.19226	2.96692	1.75015	7.07748	2.67175	1.59482	1.59482
2060	1	7.27682	0.573608	3.71725	1.16104	2.50842	5.98639	5.98639
2060	2	5.87277	5.24774	-2.45203	-0.7406	0.98349	5.28101	5.28101
2060	3	5.39474	4.13049	3.43655	2.91354	0.28891	4.26926	4.26926
2060	4	1.61639	4.41342	2.70212	2.98163	0.587646	2.47693	2.47693
2060	5	3.27982	3.58612	1.15637	3.45145	0.71521	2.7515	2.7515
2060	6	1.48328	6.55032	1.11945	5.00134	0.162292	2.34283	2.34283
2060	7	4.01535	5.84042	2.87589	5.85437	1.51578	3.67438	3.67438
2060	8	2.99292	6.01108	2.57904	7.74268	2.70029	5.29138	5.29138
2060	9	4.31732	-1.94125	3.53015	0.565399	4.3223	5.23398	5.23398
2060	10	3.62601	-8.05E-02	1.22879	2.05688	1.82358	4.17245	4.17245
2060	11	1.59558	3.40903	2.1481	3.3078	3.94812	4.72607	4.72607

2060	12	5.92E-02	3.5	5.27255	4.04327	1.34805	3.5386	3.5386
2061	1	4.44452	2.38461	4.55283	4.71185	-0.47348	4.21899	4.21899
2061	2	2.74466	2.18994	-0.67923	1.21628	0.497314	4.39313	4.39313
2061	3	2.98566	2.43008	-2.82825	1.15854	1.99722	6.58524	6.58524
2061	4	2.20309	4.48163	0.479919	1.43335	1.63104	2.39694	2.39694
2061	5	4.19479	5.8884	3.24167	0.612335	3.08783	3.59531	3.59531
2061	6	2.18689	5.3399	3.64142	1.82117	1.18311	3.11752	3.11752
2061	7	3.92654	5.19382	6.68008	3.84247	3.10779	4.8334	4.8334
2061	8	2.61902	1.76038	4.86115	2.27979	-0.97061	3.46637	3.46637
2061	9	4.84E+00	6.16385	3.94455	2.83899	-6.29E-02	5.48337	5.48337
2061	10	3.51651	5.37494	1.58551	1.27448	0.296478	7.84055	7.84055
2061	11	4.38297	3.99533	7.0372	1.32608	4.77902	3.63608	3.63608
2061	12	1.81058	3.77621	0.223938	0.162292	3.37186	6.2182	6.2182
2062	1	7.02753	2.83762	5.22644	2.97974	-0.27048	8.07739	8.07739
2062	2	2.07846	3.63992	8.49548	4.4783	4.6636	-0.53818	-0.53818
2062	3	-0.442261	3.53098	7.83057	1.98203	-0.71368	1.61865	1.61865
2062	4	3.4903	4.82971	5.8876	5.99234	1.82065	2.49704	2.49704
2062	5	2.55731	5.03802	2.36707	-0.92108	2.39441	2.6358	2.6358
2062	6	3.63367	5.99631	2.95682	1.72037	1.18039	4.84375	4.84375
2062	7	4.74075	6.07312	4.89026	3.81769	2.10999	1.25089	1.25089
2062	8	3.51181	6.87589	5.53735	5.66327	3.69687	3.35217	3.35217
2062	9	3.40512	4.04254	1.58514	2.03189	1.4946	3.74808	3.74808
2062	10	6.38449	-0.68835	3.88269	0.750671	2.86246	6.97903	6.97903
2062	11	4.78568	5.34384	6.56482	4.3443	1.43292	7.33307	7.33307
2062	12	4.96408	5.23151	4.37573	5.01538	0.13147	4.19431	4.19431
2063	1	5.12415	3.65472	3.18515	5.73386	4.97162	2.6442	2.6442
2063	2	1.48047	2.27103	6.93E-02	4.83578	1.05151	4.40082	4.40082
2063	3	7.09E-02	2.79248	5.94196	4.45493	3.28473	4.89404	4.89404
2063	4	2.366	2.76883	1.9256	2.01093	2.32596	2.59085	2.59085
2063	5	0.798218	1.21841	1.68365	2.83713	1.72543	3.91281	3.91281
2063	6	5.29028	5.7323	3.58514	2.06924	2.9895	3.96643	3.96643
2063	7	3.80515	3.70361	4.80728	2.75568	1.91479	3.4628	3.4628
2063	8	5.08994	2.21408	6.13434	4.5477	3.15598	4.48807	4.48807
2063	9	4.49493	4.17273	4.62714	6.444	3.64709	3.78726	3.78726
2063	10	4.88998	1.56656	3.62131	3.04477	3.61206	4.62714	4.62714
2063	11	4.05356	1.81683	7.2309	0.644989	3.29153	5.21005	5.21005
2063	12	5.62189	1.29492	3.29034	5.26187	0.497253	5.06003	5.06003
2064	1	-0.271362	5.14481	4.41302	3.91803	0.998932	2.923	2.923
2064	2	3.61456	2.78824	0.46579	3.3316	-1.44791	-0.89587	-0.89587
2064	3	4.44385	3.5343	0.733978	3.12045	-1.25809	4.10583	4.10583
2064	4	4.9325	1.64963	2.31281	3.00684	-0.41065	4.60745	4.60745
2064	5	3.33701	3.5824	4.10965	2.00653	4.44083	5.6087	5.6087
2064	6	2.00317	1.83932	4.59134	2.79465	4.08871	2.05725	2.05725
2064	7	-0.420868	2.27103	4.06238	2.04718	3.18658	4.45178	4.45178
2064	8	4.50943	3.47137	4.03534	2.36377	4.31906	4.39658	4.39658
2064	9	5.52472	5.64755	4.35916	-0.27329	-0.43091	3.35278	3.35278
2064	10	1.44E+00	2.04333	0.867889	1.46759	-8.48E-02	4.99905	4.99905

2064	11	1.95798	3.46133	5.0011	-1.64423	4.12024	5.87445	5.87445
2064	12	1.52048	-2.93848	3.45483	-1.49332	1.21576	3.69962	3.69962
2065	1	3.36444	4.49942	-0.31516	2.62164	-0.18747	3.7254	3.7254
2065	2	-6.52E-02	1.24182	2.73969	4.56339	0.548706	7.26852	7.26852
2065	3	2.07214	3.5679	4.04236	3.44183	2.97391	5.32895	5.32895
2065	4	-0.139679	4.91721	-0.42078	1.96555	0.773041	3.26584	3.26584
2065	5	1.68961	2.5325	0.878052	0.560028	1.53323	2.50632	2.50632
2065	6	1.53717	2.93091	3.52533	4.60464	2.2706	6.74072	6.74072
2065	7	0.318329	0.673523	3.03558	1.28387	6.2919	4.76398	4.76398
2065	8	1.41742	0.641785	4.15985	2.1579	3.06357	2.78308	2.78308
2065	9	2.60333	4.76746	2.76834	2.18979	2.5723	3.79428	3.79428
2065	10	3.9043	4.62405	1.93799	4.45767	1.06787	3.43384	3.43384
2065	11	0.679169	2.79544	2.42441	0.107971	1.55453	4.75858	4.75858
2065	12	2.14429	2.68542	5.56384	3.32736	0.887665	2.99173	2.99173
2066	1	5.95752	0.347504	-3.30875	6.23584	3.87573	4.51318	4.51318
2066	2	4.76047	3.38324	0.68399	3.17749	1.1936	7.1149	7.1149
2066	3	4.01245	-5.23E-02	3.10806	3.91373	2.41971	5.27133	5.27133
2066	4	2.43912	0.113403	4.12991	5.23013	1.47296	5.98563	5.98563
2066	5	3.79291	-9.42E-02	3.40317	6.47644	2.65363	4.96649	4.96649
2066	6	3.28467	2.65E-02	6.19913	4.33804	1.7063	3.07864	3.07864
2066	7	3.26984	3.45651	7.21027	5.02777	2.13879	4.1972	4.1972
2066	8	3.62042	4.4505	5.51364	2.62949	2.35419	3.65067	3.65067
2066	9	4.79053	2.85855	4.71674	7.50449	4.40088	3.72278	3.72278
2066	10	7.38651	3.48126	2.8071	0.665985	3.57907	6.51663	6.51663
2066	11	1.78018	2.37186	0.785004	1.13098	2.30414	5.52768	5.52768
2066	12	6.62326	2.9874	2.55365	-0.44101	3.41385	5.94211	5.94211
2067	1	5.19034	4.3681	-0.97525	1.60513	-1.52017	7.97498	7.97498
2067	2	5.54507	6.13E-02	2.89709	-3.0195	0.399109	10.5985	10.5985
2067	3	1.51056	2.24319	3.81418	-0.18506	-2.63269	1.51636	1.51636
2067	4	2.58749	4.21851	1.95932	5.76654	2.49374	2.98984	2.98984
2067	5	2.0687	3.0238	1.52158	7.06393	1.26102	2.27002	2.27002
2067	6	2.84576	3.8551	1.12012	1.56976	2.3414	3.99014	3.99014
2067	7	3.14383	4.37973	3.10147	4.40659	1.30319	4.14749	4.14749
2067	8	2.65472	3.46289	2.47104	0.457672	0.846375	6.69336	6.69336
2067	9	5.25711	2.83264	3.95135	6.49011	0.403076	7.28989	7.28989
2067	10	1.9472	6.41104	2.99219	2.26749	3.89386	5.83514	5.83514
2067	11	4.23526	2.63263	3.41699	1.4635	0.647125	5.23657	5.23657
2067	12	5.96088	2.58621	3.97784	-1.53592	1.66595	2.32602	2.32602
2068	1	5.83243	1.01962	6.31744	1.60245	1.71213	2.4942	2.4942
2068	2	6.03146	0.731232	4.43219	-0.2504	3.9176	3.63922	3.63922
2068	3	4.01334	0.512695	3.91086	2.30264	1.707	2.00525	2.00525
2068	4	4.5416	1.32742	1.84991	3.86444	2.57477	5.61603	5.61603
2068	5	1.88782	4.35931	4.63937	5.49753	2.34512	4.065	4.065
2068	6	2.63318	3.0072	1.37082	4.03024	0.977203	2.94385	2.94385
2068	7	4.48114	2.14862	2.69016	3.57678	4.96609	3.90079	3.90079
2068	8	7.72021	4.61008	3.66394	4.79138	3.21469	5.10968	5.10968
2068	9	7.55542	3.90933	2.41833	4.0918	-0.12802	6.21027	6.21027

2068	10	2.38669	2.34146	2.00931	1.63498	3.14368	6.87836	6.87836
2068	11	1.56586	0.893738	3.12811	-9.58E-02	2.01865	5.56186	5.56186
2068	12	4.35068	5.7301	1.21466	-1.36032	1.53485	5.9371	5.9371
2069	1	4.67264	4.1127	2.27325	0.315155	2.55374	6.03259	6.03259
2069	2	6.62466	3.07184	4.04697	-1.435	-4.18549	10.8606	10.8606
2069	3	3.50885	0.399689	3.99457	1.47913	0.17392	8.09924	8.09924
2069	4	1.28E+00	2.85712	3.7709	-0.86307	3.88E-02	2.17535	2.17535
2069	5	-0.238281	3.06741	1.14905	3.62183	1.21042	3.12881	3.12881
2069	6	2.17728	0.555725	3.53094	3.71646	0.262115	4.09814	4.09814
2069	7	2.67535	2.09631	2.75058	2.02249	1.48187	4.29709	4.29709
2069	8	3.16571	1.1062	3.32135	3.13168	1.83908	1.68097	1.68097
2069	9	4.45233	3.19043	3.53836	2.47641	-1.48273	4.69318	4.69318
2069	10	3.79678	2.53406	3.09161	6.46057	1.18207	3.80225	3.80225
2069	11	3.72336	3.18744	0.9617	7.14008	3.88544	3.13855	3.13855
2069	12	1.62E+00	0.574799	2.26154	9.26678	-5.62E-02	4.65402	4.65402
2070	1	4.44644	6.65891	5.56784	6.94504	0.171722	6.26099	6.26099
2070	2	2.46088	5.11905	2.46399	5.01138	-0.29971	6.24091	6.24091
2070	3	1.24216	-1.3031	2.01996	3.49673	0.274902	3.68335	3.68335
2070	4	2.2926	-2.07178	3.36432	5.12363	0.652252	2.04413	2.04413
2070	5	2.5452	5.3905	2.09616	3.46704	2.61652	2.14651	2.14651
2070	6	4.48956	1.97852	0.584534	4.62524	3.59631	4.26163	4.26163
2070	7	3.06793	1.6199	4.06406	3.57037	4.84747	5.5148	5.5148
2070	8	2.50153	1.84909	3.47156	7.30777	3.79337	5.13727	5.13727
2070	9	3.58163	-1.32465	6.74826	3.88611	-1.04272	6.90378	6.90378
2070	10	3.92938	2.82416	2.86121	3.01819	1.71835	6.02936	6.02936
2070	11	5.08136	0.851135	1.53281	4.10049	2.78052	3.77878	3.77878
2070	12	4.51208	-0.93808	3.46243	8.55249	2.28564	6.24341	6.24341
2071	1	5.79724	-1.6535	4.26904	-2.37216	-1.56638	2.71869	2.71869
2071	2	5.06097	1.31082	-1.74493	2.5668	1.14651	6.2666	6.2666
2071	3	0.17395	-1.5004	0.388672	0.478851	0.825104	3.55383	3.55383
2071	4	3.55032	2.26862	3.52802	0.118225	1.84305	5.27393	5.27393
2071	5	1.9639	1.6774	1.20078	1.58282	2.89081	3.9931	3.9931
2071	6	3.05688	0.752716	3.19763	4.14005	3.99719	0.985138	0.985138
2071	7	5.57114	1.819	4.00266	1.90118	0.120575	2.65308	2.65308
2071	8	5.19583	3.25098	5.61734	3.10349	2.60446	4.63867	4.63867
2071	9	5.09393	5.50916	5.38605	-0.46368	2.74319	5.46106	5.46106
2071	10	4.39758	1.83704	6.22672	-0.34183	0.640869	3.59186	3.59186
2071	11	4.38208	3.61655	3.9245	4.86029	2.28723	3.49097	3.49097
2071	12	3.97287	0.970001	4.95206	7.10559	0.138245	3.5444	3.5444
2072	1	3.28275	2.9458	1.61783	7.02325	3.30313	5.10178	5.10178
2072	2	4.48196	0.649628	1.19327	1.70038	1.3515	6.70151	6.70151
2072	3	1.62875	1.9068	3.11426	1.67825	1.42743	6.53586	6.53586
2072	4	1.5416	4.16751	3.4812	-0.66617	3.79706	4.17383	4.17383
2072	5	0.648499	3.60031	3.06458	4.86093	2.70782	6.82269	6.82269
2072	6	2.76028	6.37802	3.89432	3.04987	2.0607	4.83963	4.83963
2072	7	5.35126	7.9859	5.53448	2.98126	0.791382	3.97729	3.97729
2072	8	3.91531	3.22028	3.57266	8.99597	1.46417	4.11707	4.11707

2072	9	3.68552	1.16983	1.38434	4.13242	1.79037	6.26807	6.26807
2072	10	5.66708	5.15E-02	3.34369	0.859772	3.24536	6.11395	6.11395
2072	11	2.29416	3.23804	2.6055	2.7981	3.36893	5.58176	5.58176
2072	12	5.94098	1.88361	4.37604	1.96759	0.656342	2.54581	2.54581
2073	1	6.50983	3.85461	5.74783	4.18726	5.07312	1.97629	1.97629
2073	2	7.20038	2.21814	4.01578	0.253204	3.31299	0.453613	0.453613
2073	3	5.68445	4.50259	5.63815	-2.35846	0.206512	3.86176	3.86176
2073	4	7.53992	5.31342	4.46841	-0.97565	2.28314	1.90735	1.90735
2073	5	6.37271	2.07501	-0.75324	-2.13885	2.36053	4.0484	4.0484
2073	6	4.14777	4.30292	3.41443	0.593353	2.66989	4.49683	4.49683
2073	7	5.32675	4.50592	3.20267	1.66577	4.41089	2.793	2.793
2073	8	5.40063	4.28558	2.94455	2.87268	2.45697	3.74026	3.74026
2073	9	5.84692	4.77734	6.08954	-0.88931	3.02298	4.79227	4.79227
2073	10	7.33081	6.34885	5.5614	-0.89612	3.07376	3.79495	3.79495
2073	11	5.27307	3.41724	5.3548	2.8595	3.07794	5.49506	5.49506
2073	12	4.32596	4.81622	2.53445	2.78146	0.362671	6.18442	6.18442
2074	1	2.95773	4.1944	6.35464	5.52774	0.431946	5.21368	5.21368
2074	2	0.477875	4.30392	5.48398	2.07761	2.98911	7.39081	7.39081
2074	3	3.60165	3.96338	5.04947	-1.10626	2.78271	3.92966	3.92966
2074	4	2.509	0.347504	3.577	-0.57825	3.91257	1.63773	1.63773
2074	5	1.55E+00	2.64423	2.11426	0.869141	1.09E-02	1.7439	1.7439
2074	6	6.01889	0.973907	2.18222	4.17545	0.885895	2.22635	2.22635
2074	7	4.37613	0.900909	4.93668	1.55328	0.708984	3.43719	3.43719
2074	8	6.21854	0.527283	6.14014	3.55188	2.33627	4.80188	4.80188
2074	9	0.563019	1.72714	3.80594	1.7597	-0.5126	3.18616	3.18616
2074	10	3.7135	2.85336	5.36661	2.62289	0.881073	5.20834	5.20834
2074	11	5.28738	2.67404	5.4325	0.955078	3.70905	5.97586	5.97586
2074	12	2.89578	2.41782	3.23395	5.21536	3.32626	4.21191	4.21191
2075	1	3.66632	1.66351	6.07913	-0.90277	2.62683	10.4736	10.4736
2075	2	1.15637	5.61932	-0.29041	7.25E-02	2.7684	2.09671	2.09671
2075	3	2.46655	4.63718	3.45236	2.52173	0.378601	2.20044	2.20044
2075	4	4.0686	2.48752	2.06732	4.05975	1.71286	3.77725	3.77725
2075	5	3.108	4.98282	1.48706	3.13083	0.868225	2.82642	2.82642
2075	6	3.08328	7.03992	-0.30066	2.18054	1.7543	3.90634	3.90634
2075	7	3.26184	2.53003	2.13586	1.72949	2.0842	5.02969	5.02969
2075	8	7.46783	5.95209	4.56213	3.48718	0.144867	6.71237	6.71237
2075	9	6.01242	5.18594	5.35403	3.2796	-0.69772	7.11136	7.11136
2075	10	3.6283	1.93274	8.42349	1.96957	1.53998	4.39804	4.39804
2075	11	2.38736	1.73074	1.92502	-0.75241	-1.01605	2.48306	2.48306
2075	12	3.40158	2.13211	4.96765	9.46408	-1.98953	6.57883	6.57883
2076	1	5.63934	4.34641	5.14774	-1.46E-03	-0.27716	6.53439	6.53439
2076	2	2.59756	4.94293	1.16708	-3.3898	1.7114	-0.7695	-0.7695
2076	3	1.26846	1.70169	1.82996	-4.81E-02	-0.11948	4.52884	4.52884
2076	4	1.92062	0.768829	2.34332	0.139648	2.91437	4.56973	4.56973
2076	5	3.2244	3.7738	3.22067	0.800629	3.32843	2.83029	2.83029
2076	6	5.72519	2.32962	1.79013	3.85425	1.7276	3.17044	3.17044
2076	7	4.61603	2.82462	4.52176	1.78217	4.6752	5.24698	5.24698

2076	8	3.78821	2.22849	5.46475	3.2316	3.59198	4.86038	4.86038
2076	9	4.61902	5.43533	4.12875	3.63159	0.407288	5.74158	5.74158
2076	10	4.2612	0.292358	4.14072	0.170288	2.84647	3.87415	3.87415
2076	11	2.78006	2.98755	2.8338	1.3349	4.19522	4.66586	4.66586
2076	12	3.77206	1.00031	4.93555	3.95459	3.80396	6.05823	6.05823
2077	1	7.36423	1.60291	2.14365	5.40625	7.79614	4.96759	4.96759
2077	2	4.38129	2.09213	1.96387	4.87439	6.4075	7.845	7.845
2077	3	2.34784	0.763092	6.07108	1.46884	3.03961	6.05356	6.05356
2077	4	3.26572	2.3963	2.6933	2.50095	1.23337	2.99683	2.99683
2077	5	1.0509	2.2316	2.09317	4.30624	2.85721	4.92392	4.92392
2077	6	3.10458	2.9425	2.83182	5.58237	2.48349	4.99933	4.99933
2077	7	5.42743	4.91241	4.49948	2.09409	3.77628	6.05948	6.05948
2077	8	6.06073	0.987091	7.12906	3.57999	1.63907	4.42136	4.42136
2077	9	8.17502	6.41983	3.71594	5.7562	-0.11142	4.78888	4.78888
2077	10	3.64621	3.68576	3.57571	5.32898	3.03906	5.16364	5.16364
2077	11	0.477356	3.92114	5.42551	1.36288	2.22192	4.10938	4.10938
2077	12	3.09927	-0.60111	3.96255	4.61258	-1.98825	4.84711	4.84711
2078	1	6.13074	0.430115	5.31424	3.29056	3.47992	7.763	7.763
2078	2	4.16788	1.11282	3.13208	3.37878	3.45361	4.2771	4.2771
2078	3	2.87994	3.34348	-3.15753	4.20523	0.468414	5.06354	5.06354
2078	4	3.14392	1.4299	4.4072	1.76724	2.06357	3.50534	3.50534
2078	5	6.01242	2.37833	1.79657	0.582245	3.61203	3.62891	3.62891
2078	6	4.32239	4.13971	2.36554	4.32864	-0.49741	4.96674	4.96674
2078	7	7.10303	2.73093	4.31747	2.32986	2.35419	5.66519	5.66519
2078	8	5.25122	1.08899	5.44974	6.61807	2.05917	5.57986	5.57986
2078	9	4.05753	5.85E-02	4.22604	4.6517	3.38889	5.21317	5.21317
2078	10	6.13278	1.22116	3.082	4.2114	1.42337	2.48856	2.48856
2078	11	2.29407	5.02133	9.13E-02	6.63419	4.50073	3.94678	3.94678
2078	12	1.18118	1.29642	-3.13394	1.95749	0.822357	4.3197	4.3197
2079	1	3.13174	4.4024	-1.66565	-2.16257	2.03152	2.5253	2.5253
2079	2	0.117279	1.27283	1.62988	1.13278	0.338501	5.2724	5.2724
2079	3	1.36615	2.81458	1.49026	0.799438	-0.30197	3.84085	3.84085
2079	4	2.9826	2.04791	4.15601	4.69885	0.791046	4.71674	4.71674
2079	5	3.62289	5.32941	1.05707	0.613831	3.68933	2.90891	2.90891
2079	6	1.71417	-0.3728	3.76913	1.68555	1.8331	2.34155	2.34155
2079	7	5.37335	3.59802	5.65176	5.13367	4.03058	3.75858	3.75858
2079	8	3.95712	6.33749	3.62875	2.11459	1.48688	3.37225	3.37225
2079	9	2.85202	2.33325	4.47433	-0.9783	-0.48181	4.72559	4.72559
2079	10	5.25198	0.334137	4.10959	1.9343	1.18576	9.33484	9.33484
2079	11	2.34348	4.27444	8.43481	0.171173	2.94913	8.65536	8.65536
2079	12	5.24298	3.78851	4.44904	2.85428	2.51276	5.8197	5.8197
2080	1	4.66293	4.32162	6.71533	3.44623	0.990448	7.78629	7.78629
2080	2	5.05426	5.42633	5.68808	2.3764	3.36789	3.87772	3.87772
2080	3	3.41824	-0.14142	4.09897	3.08014	-2.41537	4.40256	4.40256
2080	4	1.94852	0.353516	1.86462	0.658539	0.372559	3.86273	3.86273
2080	5	3.87851	4.57581	2.87418	1.51614	1.45914	3.24139	3.24139
2080	6	3.34628	3.289	4.40234	2.84564	1.31259	4.16315	4.16315

2080	7	4.20465	0.46991	4.93216	4.12317	4.98709	4.87198	4.87198
2080	8	4.69461	0.257904	5.04803	3.33939	3.56097	2.85107	2.85107
2080	9	0.590424	1.03183	2.84415	4.33151	3.30179	3.02756	3.02756
2080	10	2.961	4.29684	3.27301	6.20428	0.235352	3.17496	3.17496
2080	11	6.19366	5.11215	5.45322	5.32867	4.00623	6.29715	6.29715
2080	12	4.16669	3.49982	4.21735	4.22208	1.97797	4.3446	4.3446
2081	1	4.35474	5.87662	4.35513	3.35464	2.93024	-3.29422	-3.29422
2081	2	5.53076	1.83932	3.04929	0.996185	0.598816	-1.95938	-1.95938
2081	3	4.24744	1.95499	4.07327	1.23273	4.0379	4.66144	4.66144
2081	4	5.4545	3.4404	5.48172	2.22925	0.513855	3.22263	3.22263
2081	5	4.48489	3.52573	5.34216	1.59103	0.68631	3.70071	3.70071
2081	6	4.14056	3.9736	3.80045	2.12854	3.39221	4.32874	4.32874
2081	7	5.37585	6.31732	5.31638	3.32867	0.882385	4.30878	4.30878
2081	8	4.87921	3.41177	5.87256	3.48389	2.88766	4.96716	4.96716
2081	9	6.59332	0.222931	5.10376	6.07291	2.28427	4.52426	4.52426
2081	10	3.60721	1.12634	7.49951	1.73837	2.30215	7.16425	7.16425
2081	11	1.51178	3.83124	2.9946	8.79E-02	2.76285	3.94098	3.94098
2081	12	2.73987	1.43942	5.34906	0.192383	2.33145	5.40201	5.40201
2082	1	5.17633	4.81641	4.15735	7.22064	1.47443	5.9455	5.9455
2082	2	6.18948	-0.88757	3.05289	1.7858	-1.74631	10.4351	10.4351
2082	3	0.224854	4.0835	3.04675	0.781738	2.49411	6.87946	6.87946
2082	4	1.74542	2.7742	3.16422	1.89694	2.10226	2.29443	2.29443
2082	5	5.62881	1.9252	1.61026	2.43073	-0.38696	4.97852	4.97852
2082	6	4.55908	4.53491	3.86804	3.51096	0.658112	4.83224	4.83224
2082	7	3.68665	3.48511	4.91046	3.99808	3.47897	5.50998	5.50998
2082	8	4.30E+00	3.93039	5.93304	1.00177	6.17E-02	5.56757	5.56757
2082	9	6.22751	4.32733	6.13086	5.69821	-1.04211	6.44626	6.44626
2082	10	4.59039	5.51755	2.74469	-0.5704	2.17505	5.79425	5.79425
2082	11	3.82147	2.92914	4.17749	1.35068	0.381836	2.08267	2.08267
2082	12	6.17249	1.9834	1.50455	6.12177	0.208466	6.31482	6.31482
2083	1	3.47812	6.24011	1.18304	4.32245	0.503235	-0.77042	-0.77042
2083	2	2.42886	5.18884	6.00497	-0.1214	-3.29568	3.65161	3.65161
2083	3	3.11343	1.45798	2.60037	-2.57285	0.207703	2.79663	2.79663
2083	4	4.33212	1.04593	-0.1044	-2.16977	1.20825	2.42075	2.42075
2083	5	2.43781	4.63211	2.18558	1.34012	0.963531	3.66629	3.66629
2083	6	3.69449	6.7254	2.53323	2.63095	-0.36749	4.37943	4.37943
2083	7	4.72504	6.29202	4.52686	3.23157	0.185883	4.4296	4.4296
2083	8	6.48273	7.76318	4.64084	2.32788	1.23718	3.76398	3.76398
2083	9	4.59753	0.422241	5.75946	3.56631	1.94308	4.90387	4.90387
2083	10	5.3566	0.522034	4.83191	2.93979	1.35577	3.21133	3.21133
2083	11	5.46878	3.01364	5.38391	2.27737	2.71814	3.21606	3.21606
2083	12	5.64148	2.5665	5.34274	6.59106	5.86026	3.39423	3.39423
2084	1	5.22104	1.23721	3.34534	4.83673	3.00894	3.28278	3.28278
2084	2	3.35446	3.13443	1.19098	-1.68512	3.10971	1.75351	1.75351
2084	3	2.43384	4.34009	2.86E-02	2.64062	2.2395	2.02243	2.02243
2084	4	3.55212	1.80121	2.5918	2.86505	1.15695	5.03445	5.03445
2084	5	3.93311	4.2345	2.02066	4.16562	2.08472	3.96011	3.96011

2084	6	6.10E+00	0.578003	2.08743	3.75436	-9.89E-02	4.43234	4.43234
2084	7	5.88135	2.44431	4.47287	2.31888	2.29218	4.25519	4.25519
2084	8	6.14774	3.37039	7.14703	4.98209	2.47568	5.65027	5.65027
2084	9	6.67871	1.54483	6.05295	2.5321	0.591888	4.59418	4.59418
2084	10	5.42218	2.63736	0.545593	1.07269	2.57605	5.12274	5.12274
2084	11	6.36148	5.21954	5.01981	2.10977	1.18124	4.69186	4.69186
2084	12	3.39966	3.16962	5.90396	6.62238	3.29745	0.745422	0.745422
2085	1	7.14514	4.48441	3.41403	4.46234	3.92795	7.54019	7.54019
2085	2	3.58807	4.72784	-0.65051	0.980804	3.81299	10.3186	10.3186
2085	3	9.19E-02	2.89749	1.95157	3.25894	3.55081	3.55563	3.55563
2085	4	3.11441	4.9342	3.31842	0.344635	2.99347	1.22363	1.22363
2085	5	1.96661	5.70691	2.33127	2.51413	0.984009	3.05811	3.05811
2085	6	3.24347	3.12451	2.69785	4.68985	3.03119	5.35373	5.35373
2085	7	5.35886	0.610016	5.24997	0.545685	2.07959	7.76639	7.76639
2085	8	9.75433	3.48938	3.12054	6.7132	0.29007	2.98495	2.98495
2085	9	4.01172	2.91235	5.24225	8.3418	-0.47372	3.42517	3.42517
2085	10	5.21671	5.39664	0.124298	-1.13	2.45328	2.31775	2.31775
2085	11	3.07428	4.48355	4.85281	4.30807	2.67145	2.34348	2.34348
2085	12	4.84048	0.614899	5.26724	3.70209	1.11746	6.75912	6.75912
2086	1	2.08694	2.78131	5.58444	3.44275	3.26352	6.4194	6.4194
2086	2	1.74557	2.64304	1.24319	5.65268	5.06491	6.89502	6.89502
2086	3	2.23666	4.67639	1.63116	4.03195	1.15051	2.59634	2.59634
2086	4	2.73721	4.30511	0.441406	1.31653	-0.59464	2.91794	2.91794
2086	5	3.6713	5.16751	-0.25732	5.12204	1.21793	3.79352	3.79352
2086	6	4.58517	0.340302	2.52744	1.82755	-0.65891	2.92764	2.92764
2086	7	6.87134	4.1611	0.919769	6.50217	5.672	5.07938	5.07938
2086	8	2.76962	3.55048	1.99155	5.76797	3.53506	4.60727	4.60727
2086	9	6.55093	4.80054	1.41556	6.80222	1.2728	6.29169	6.29169
2086	10	4.49969	2.28894	4.09412	2.75708	1.56586	3.78156	3.78156
2086	11	3.05658	5.99866	2.0448	4.72668	4.64142	6.20245	6.20245
2086	12	2.13626	2.06671	3.98184	9.19E-02	0.435455	6.02643	6.02643
2087	1	6.01303	1.64722	3.25403	7.49564	1.38715	6.32999	6.32999
2087	2	6.28317	2.83243	2.10919	1.47488	0.789886	7.9364	7.9364
2087	3	3.72116	2.58319	2.71716	-2.06305	-0.1449	8.27365	8.27365
2087	4	3.67511	5.90182	3.01392	2.93033	3.13965	5.09335	5.09335
2087	5	1.29791	4.65253	1.04745	2.43982	1.68243	4.00821	4.00821
2087	6	1.46768	5.72672	1.62033	6.33554	0.402618	3.72552	3.72552
2087	7	4.07645	6.4248	3.27078	7.48407	2.67148	4.94189	4.94189
2087	8	5.97653	6.39078	3.05624	6.46347	1.83218	6.46808	6.46808
2087	9	4.63513	3.48636	3.06955	10.4434	4.26929	4.82736	4.82736
2087	10	5.7926	4.79376	3.90771	-0.43411	3.63428	8.27475	8.27475
2087	11	3.85278	3.45483	5.34781	1.89517	1.67654	6.83035	6.83035
2087	12	5.52777	5.07141	4.81284	4.54727	0.281769	4.10321	4.10321
2088	1	3.61453	4.211	7.99115	9.84116	2.30353	7.20328	7.20328
2088	2	1.67139	3.49072	6.87628	4.16428	5.51559	5.26392	5.26392
2088	3	1.89474	3.8779	7.10947	6.08414	2.25421	5.87125	5.87125
2088	4	2.5433	4.2532	-1.37518	3.14755	2.08484	1.39093	1.39093

2088	5	3.88812	4.86072	3.89136	5.62393	3.06702	4.25092	4.25092
2088	6	3.83859	4.70651	6.43002	3.03885	0.403412	6.17725	6.17725
2088	7	6.08804	5.29041	6.27036	2.09628	1.6973	6.94858	6.94858
2088	8	6.04672	8.1344	4.13394	3.11868	2.72168	6.38147	6.38147
2088	9	3.59073	3.89426	3.66165	3.703	3.0553	7.31989	7.31989
2088	10	5.74991	3.32825	3.0784	3.06607	1.92215	7.24603	7.24603
2088	11	3.07608	1.80396	1.4826	3.10339	-1.67715	8.71487	8.71487
2088	12	2.36768	4.17941	1.02164	9.27148	-1.50995	3.37891	3.37891
2089	1	0.132538	2.74371	-0.49307	5.44965	2.86462	-1.8548	-1.8548
2089	2	6.87369	3.89694	5.28E-03	1.5152	6.3866	4.53012	4.53012
2089	3	2.38583	-8.51E-02	6.03696	3.19553	2.18253	0.75116	0.75116
2089	4	2.7482	-0.68109	2.09482	2.02713	-0.49796	4.89243	4.89243
2089	5	1.94772	3.46771	3.51367	8.05844	2.44812	6.4212	6.4212
2089	6	3.88077	7.2045	2.25772	4.34357	1.73669	2.85052	2.85052
2089	7	5.68213	3.51392	4.39297	3.72607	2.54059	4.05859	4.05859
2089	8	7.27991	3.25128	1.27536	3.26468	0.542267	6.70297	6.70297
2089	9	7.54E+00	1.45984	1.77356	5.2879	-6.32E-03	6.37537	6.37537
2089	10	3.26718	4.39294	4.15329	1.94867	0.965576	3.60825	3.60825
2089	11	3.44247	3.47403	5.14819	3.23148	2.37894	5.93167	5.93167
2089	12	4.47598	3.9122	3.33606	8.01547	-0.59503	4.00531	4.00531
2090	1	3.48444	5.198	3.35345	10.3918	-2.09137	9.07648	9.07648
2090	2	3.07898	2.69843	1.29349	0.112183	3.07391	9.64011	9.64011
2090	3	1.96585	1.19919	4.10696	4.21915	0.699524	6.42184	6.42184
2090	4	5.98911	0.665619	3.448	1.34222	0.479553	7.31055	7.31055
2090	5	5.99472	5.83051	2.73148	5.30472	1.90323	4.23599	4.23599
2090	6	3.53528	3.51022	4.91434	3.96097	0.276611	2.68073	2.68073
2090	7	2.96384	3.11972	5.61728	5.90857	3.95078	4.3063	4.3063
2090	8	4.00323	2.27118	6.49854	7.79309	4.29529	4.73126	4.73126
2090	9	5.60022	2.37634	5.60583	4.54419	2.88568	4.64377	4.64377
2090	10	5.08319	-0.32565	6.72491	2.87869	1.31375	5.74045	5.74045
2090	11	3.58606	1.28314	4.97931	1.62057	0.789642	2.77847	2.77847
2090	12	4.47537	2.89212	0.48114	-0.72333	-1.74603	6.5845	6.5845
2091	1	6.21002	3.49969	2.59753	-0.39917	-3.80026	6.83868	6.83868
2091	2	4.97849	5.27335	-1.88593	1.20868	4.59891	4.39722	4.39722
2091	3	2.44925	2.53589	7.51108	2.78934	1.11801	3.45813	3.45813
2091	4	5.50381	5.50333	6.05591	0.525024	2.62564	4.27484	4.27484
2091	5	3.30331	5.39941	1.16415	-1.23108	0.478027	4.3168	4.3168
2091	6	1.65198	4.74081	4.08585	4.24466	0.490692	4.29803	4.29803
2091	7	3.55914	3.24753	4.92508	4.76376	4.11578	3.11539	3.11539
2091	8	7.77853	2.8071	4.93115	3.71457	1.24136	6.23758	6.23758
2091	9	6.23291	0.305359	6.13095	2.6821	-0.15323	7.45578	7.45578
2091	10	7.1994	4.44666	5.52289	2.65308	2.30847	4.68994	4.68994
2091	11	4.00076	5.35474	5.15341	2.64429	0.824921	7.54398	7.54398
2091	12	2.20447	2.72861	5.33725	4.07147	4.44916	7.186	7.186
2092	1	3.70624	5.58292	-0.99396	8.34393	5.88913	6.595	6.595
2092	2	4.00287	4.44073	-4.74E-02	3.97629	3.8544	8.77811	8.77811
2092	3	2.29016	2.52158	-1.07074	-0.71387	2.59161	6.82385	6.82385

2092	4	1.99991	7.14441	2.10651	0.698334	0.765564	4.19043	4.19043
2092	5	6.34161	4.9613	2.39825	1.84433	4.73633	0.167511	0.167511
2092	6	9.11078	6.08752	4.11154	3.62866	2.7847	5.13245	5.13245
2092	7	6.70883	3.2872	3.65146	4.01917	3.04318	4.6553	4.6553
2092	8	6.06781	0.764984	7.01996	2.59207	5.70139	5.76736	5.76736
2092	9	3.75873	7.00885	3.57654	5.48801	1.8526	6.83527	6.83527
2092	10	1.51459	1.72296	6.38339	5.96249	0.152161	5.11163	5.11163
2092	11	2.71298	1.43414	-1.1991	5.5437	0.285736	4.57587	4.57587
2092	12	6.84897	-2.42E-02	3.47824	6.93356	0.556366	1.55173	1.55173
2093	1	4.01974	3.26202	4.89124	9.86954	3.08563	5.93118	5.93118
2093	2	1.28427	5.56424	3.56277	1.02899	1.7467	2.4743	2.4743
2093	3	1.07376	1.35648	5.40106	4.87244	1.66	-3.37946	-3.37946
2093	4	2.1492	3.8208	2.30222	3.22083	0.270844	2.98514	2.98514
2093	5	1.5441	2.07581	1.61407	2.11813	-0.31729	0.922394	0.922394
2093	6	3.88629	4.30331	4.12613	4.52176	1.64691	4.20993	4.20993
2093	7	3.27216	3.57993	6.31366	5.98367	1.0365	4.11789	4.11789
2093	8	6.84082	1.00629	6.63293	5.56699	0.32077	5.17206	5.17206
2093	9	4.88681	2.12704	4.23206	6.44849	3.49969	3.87048	3.87048
2093	10	5.4519	0.147858	7.2941	2.05667	1.27615	6.46133	6.46133
2093	11	3.82236	2.12006	2.55029	-0.3374	3.47522	4.51666	4.51666
2093	12	5.71777	3.69141	4.75174	4.72617	1.79254	4.16513	4.16513
2094	1	4.61612	1.95462	4.89304	4.96884	-2.97458	3.98648	3.98648
2094	2	1.68079	3.22723	5.54617	-0.271	1.79819	7.30612	7.30612
2094	3	5.46924	2.905	4.66446	1.73114	-0.34168	2.85635	2.85635
2094	4	5.3623	5.59003	1.2818	1.23383	-0.18955	5.52725	5.52725
2094	5	6.69202	4.24863	2.11926	2.28683	0.666931	4.97781	4.97781
2094	6	7.80676	5.3797	5.13312	1.58905	0.982513	3.98514	3.98514
2094	7	5.65E+00	3.83591	7.94067	2.73569	2.11E-02	6.09549	6.09549
2094	8	3.62961	3.62558	6.08304	4.68298	2.20288	5.35806	5.35806
2094	9	5.19742	3.72556	2.57745	6.02759	0.527191	3.90549	3.90549
2094	10	4.23459	1.94754	5.06271	5.10178	1.32007	6.39163	6.39163
2094	11	3.89166	5.09995	8.11319	3.98947	1.88513	6.10056	6.10056
2094	12	5.94318	4.47311	3.71603	4.60406	3.77957	6.75693	6.75693
2095	1	4.29883	4.61301	6.30875	-0.86307	1.49203	6.31769	6.31769
2095	2	4.28717	4.75333	2.96097	-0.2193	-3.09381	1.23801	1.23801
2095	3	1.73636	3.42288	6.11838	2.74503	1.55432	-0.27936	-0.27936
2095	4	3.82492	2.21991	1.4852	4.11105	1.52356	4.58035	4.58035
2095	5	5.79581	3.86362	1.69476	1.98734	0.863922	3.9086	3.9086
2095	6	5.01617	3.86652	4.81424	5.54755	-0.42249	4.99554	4.99554
2095	7	4.10544	2.0325	7.95337	3.02127	1.56058	5.3222	5.3222
2095	8	5.17142	5.20209	5.56534	3.51379	0.257477	5.04657	5.04657
2095	9	4.95462	5.28375	3.97543	6.48279	1.35269	5.64166	5.64166
2095	10	6.54739	1.57916	6.7514	5.57828	0.336548	4.40485	4.40485
2095	11	4.48978	5.88043	4.86041	6.59698	2.19904	6.43677	6.43677
2095	12	2.05237	3.81842	2.93063	7.92288	-0.12784	3.64923	3.64923
2096	1	1.61212	4.18472	5.54993	7.11795	-3.09027	7.57828	7.57828
2096	2	0.637482	4.09494	-2.27E-02	3.35608	4.84351	6.22012	6.22012

2096	3	3.95224	1.95129	1.10947	0.550934	3.31873	0.91925	0.91925
2096	4	5.15741	2.23572	2.77371	4.53693	0.87204	3.48215	3.48215
2096	5	5.46942	3.80301	0.477875	2.50632	2.42062	0.129211	0.129211
2096	6	6.92E+00	2.56161	3.04352	7.01227	8.61E-02	3.69833	3.69833
2096	7	7.20093	4.18732	1.64316	5.15918	1.65399	3.87079	3.87079
2096	8	6.11472	0.653381	4.17294	1.47287	2.46167	4.39786	4.39786
2096	9	8.23752	2.67465	4.41486	3.81131	-0.82941	5.60828	5.60828
2096	10	3.99521	1.05246	3.04919	0.412079	-2.45844	4.44595	4.44595
2096	11	2.15607	2.63416	5.5209	5.48898	2.90594	2.42465	2.42465
2096	12	6.30508	2.6463	0.418335	5.13818	4.05396	5.16272	5.16272
2097	1	7.49792	3.50302	1.07843	3.53204	0.628418	0.684875	0.684875
2097	2	1.73807	2.96722	-0.11963	3.33609	2.28979	6.35632	6.35632
2097	3	4.77036	4.7916	4.21695	5.59283	2.84583	7.04205	7.04205
2097	4	7.4274	0.489105	2.5531	3.10684	1.79065	6.62515	6.62515
2097	5	2.9418	2.88052	1.66046	3.97913	4.52502	4.83499	4.83499
2097	6	4.16959	2.80832	2.20102	5.19257	5.4021	5.43253	5.43253
2097	7	4.27643	3.83102	2.53668	3.54019	5.50247	5.0423	5.0423
2097	8	4.40912	1.7533	4.29504	9.30878	3.65756	7.16876	7.16876
2097	9	8.09354	-1.47824	2.13266	5.80081	3.52597	5.65146	5.65146
2097	10	3.54639	2.81644	1.39581	5.94067	0.573761	5.64545	5.64545
2097	11	4.21027	3.64383	5.36151	2.3024	4.25024	5.70645	5.70645
2097	12	0.847565	3.23761	-1.17804	5.85498	1.61465	1.98032	1.98032
2098	1	3.47214	2.6413	4.91443	6.09253	0.244537	5.29559	5.29559
2098	2	0.392761	1.93573	3.80118	-5.57E-02	1.92981	7.35562	7.35562
2098	3	-1.56326	0.793579	4.22318	7.06363	0.103516	6.11844	6.11844
2098	4	3.1702	4.00763	2.8638	1.58533	2.44086	5.41843	5.41843
2098	5	2.72021	3.6886	3.27475	3.83524	4.57782	3.88501	3.88501
2098	6	3.35727	2.00531	6.00095	4.01605	2.77121	2.90363	2.90363
2098	7	5.62845	5.96652	5.33508	3.75269	2.92767	4.52469	4.52469
2098	8	4.94003	4.74338	5.69485	4.1904	1.20828	5.51517	5.51517
2098	9	5.99701	3.40494	7.15463	5.21439	4.38248	5.92957	5.92957
2098	10	6.60388	1.93924	5.1553	2.47449	1.30338	5.64835	5.64835
2098	11	4.65567	3.44644	4.1015	3.92868	1.66922	3.69138	3.69138
2098	12	3.60477	2.20331	1.22845	7.07916	3.41797	4.08072	4.08072
2099	1	2.29074	3.73291	3.33603	8.34033	5.00745	3.20099	3.20099
2099	2	1.90729	4.18234	7.27637	5.07919	1.8519	5.6535	5.6535
2099	3	3.31345	3.3616	5.56137	3.89764	1.85822	4.48004	4.48004
2099	4	2.29141	2.15302	-1.17438	2.51733	0.139252	1.87463	1.87463
2099	5	3.15442	3.93231	2.90265	2.38803	0.262512	3.202	3.202
2099	6	3.56216	10.0411	3.47183	5.14725	0.481689	4.35474	4.35474
2099	7	0.890045	5.34512	4.32727	7.05289	1.94418	3.4794	3.4794
2099	8	6.12021	5.92899	4.00925	4.97488	-2.78043	4.12967	4.12967
2099	9	6.01773	5.64896	4.62314	7.56531	1.85138	8.32437	8.32437
2099	10	5.52451	-0.62784	5.38751	5.14047	-2.17395	3.42584	3.42584
2099	11	2.16968	1.60565	3.53979	-0.81921	-1.90347	5.20117	5.20117
2099	12	6.22046	3.30682	4.63763	4.70749	3.91745	5.10022	5.10022
2100	1	3.78354	3.51132	4.44574	3.53345		6.03918	6.03918

2100	2	3.08847	2.94E-02	6.14807	3.89139	6.1882	6.1882
2100	3	0.961761	1.40659	4.41367	2.64783	6.26276	6.26276
2100	4	1.58582	4.35822	3.51251	5.38483	4.94504	4.94504
2100	5	2.93719	3.63593	2.91718	0.206635	3.6265	3.6265
2100	6	4.95776	-0.8634	3.85114	2.83475	5.73175	5.73175
2100	7	6.92004	2.49692	6.46146	2.86679	7.7579	7.7579
2100	8	8.29202	4.0965	6.40744	4.82468	4.57727	4.57727
2100	9	5.98111	4.54193	6.45276	4.51019	8.77869	8.77869
2100	10	5.09259	4.22534	5.23489	1.60059	5.40366	5.40366
2100	11	4.27328	3.47183	2.8707	3.16629	7.34265	7.34265
2100	12	3.57727	4.2623	3.20483	-1.02771	5.93832	5.93832

7	8	9	10	11	12	13	14	15	16
CanESM5/1	CESM2	CESM2-WA	CIESM	CMCC-CM2	CNRM-CM1	CNRM-CM1	CNRM-ESM	EC-Earth3	EC-Earth3-
1.36469	-1.52161	-0.91745	-4.87512	-3.54996	0.646912	2.74319	3.01981	-3.98743	1.96176
3.10034	0.589142	-6.32E-02	-7.62271	-0.48999	-5.11E-02	-1.17087	6.19662	2.68314	3.00742
5.21182	2.26608	-1.1713	-3.03812	-4.96207	-0.7432	-3.42505	2.19345	-2.73648	-1.0896
2.02423	1.40292	-2.31689	-2.0083	-3.12418	-1.90494	-3.54147	1.49002	1.69525	-4.65E-02
0.501587	6.89E-02	-0.88394	-2.37296	-1.61334	-2.16113	-2.54208	-0.14819	0.357025	-0.87341
-2.02087	-1.22516	0.967438	-3.13608	-2.1405	-0.32388	0.199402	3.01532	-1.19681	-1.71973
0.404785	-0.88858	3.07101	-2.5715	-2.67645	-0.44394	0.622284	3.42612	-0.99838	1.27414
0.236267	-1.24667	-1.90601	-2.70868	-3.18332	0.493622	-0.3125	1.51376	-1.57111	0.407928
1.13806	-1.4176	-2.51471	-3.00571	-1.03116	-0.18243	-0.17377	4.17465	-2.41711	1.46872
-0.84863	-1.93375	0.755585	-0.5589	-3.06812	-0.84476	4.67E-02	-0.82462	2.01358	-0.40222
-2.3237	-1.38522	-0.93622	-3.4075	-3.1438	-0.98233	-5.21484	4.98E-02	1.89279	-1.66168
-0.38156	-0.77585	-1.73688	-2.39734	-0.15668	-1.9465	-3.77341	3.34131	1.54901	-1.08444
0.265564	-2.04001	3.02756	0.47348	1.84412	-1.86798	1.96701	2.31601	0.765259	-0.76065
4.68515	-2.79807	3.19986	6.23779	2.97702	-1.91043	1.49353	3.07822	1.62372	1.38373
1.60181	-3.32693	1.0661	-0.33133	3.94254	-4.42477	-0.43076	2.87164	1.38211	4.38641
-1.13748	-4.21176	1.58051	-3.47641	-0.88916	-3.50833	-2.77448	2.30521	-0.23325	0.765778
-1.4631	0.666199	-2.19574	-1.25696	-1.63205	-3.10013	-1.28378	1.10483	1.30533	-2.70319
-0.67148	3.27945	1.99634	-1.84839	-3.5762	-0.77747	-1.03949	-1.68738	8.27E-03	-1.11472
0.329468	0.166229	3.85062	-2.7934	-1.46283	-2.04813	-0.45712	-0.6069	-1.36749	-3.26E-02
1.66586	-3.78357	-0.24741	0.250916	-1.41254	-1.9968	1.48462	-7.69E-02	-0.83072	-0.57355
-0.98044	0.452393	2.26859	0.310486	-0.60635	-1.57593	-2.13669	1.98975	0.786896	-1.53128
-1.11142	-1.46075	-0.75021	-1.00421	-3.03922	-1.89264	-1.18466	-0.53851	-2.01303	0.299164
0.587006	0.733185	0.202576	0.644012	-0.95972	-0.12274	0.181061	9.49E-03	0.405975	-2.90311
2.03741	1.69E-02	-0.69757	-0.45154	-3.06775	-6.07672	3.39252	1.46698	-1.67981	-6.47E-02
3.73587	-1.02829	-1.03766	-2.34061	-3.60358	-3.32727	-0.29309	5.26001	7.02008	-0.91065
2.60175	2.97433	0.653442	0.226685	-5.2233	4.12067	-0.82697	2.34E-02	4.61313	1.51071
3.04321	1.84158	0.464813	-0.14441	1.25674	1.36252	3.94553	1.23715	-0.16098	0.402222
3.81042	4.01404	1.17029	-2.43393	-0.38568	-1.61752	0.586639	0.836212	0.227356	-3.28482
-1.48312	1.13461	0.817078	-1.70566	-1.92685	-1.12564	-2.38208	1.72763	1.19531	-1.8324
0.500427	1.96475	3.24435	-1.10568	-1.32581	-1.14056	-0.5188	0.302826	-1.20731	0.51709
-2.73392	-0.37357	0.188904	-1.68381	-1.38705	-1.05313	-1.26764	0.932404	0.56839	1.65866
-2.37283	1.98444	0.591583	-0.60178	-1.30682	-0.98529	-1.93091	0.542572	0.449493	0.796234
-2.67725	1.13599	-0.6557	-4.70E-02	-3.26306	-1.60193	-4.16687	1.24506	8.09E-02	-2.3754
0.391388	-0.24866	0.207794	-3.03061	-2.39331	-0.82315	0.603851	-3.18832	1.14359	0.661591
-5.45789	1.67728	1.12738	-2.94321	-0.56992	0.592865	0.560059	-0.28101	1.3082	-2.8093
-2.51416	-0.59476	-1.28598	-0.32666	2.63425	-8.75781	-1.88229	0.356781	1.84351	-0.90317
-4.26593	-2.0304	-1.30685	4.76639	-2.06546	-3.90317	-2.83359	5.83221	-0.74692	0.666351
-1.44354	-3.02026	-3.12045	3.82568	-3.14789	0.55658	-0.69177	4.24542	-2.52435	0.432831
-4.7175	-3.09482	-3.38928	1.70309	-4.26797	1.77612	-1.11447	0.744843	-2.53568	0.546295
-2.31879	-2.07788	-1.03571	-2.42673	-1.82498	-0.33102	-1.18909	-2.53018	-1.35443	1.36386

-0.4819	1.74542	-0.37723	-1.51956	-1.79965	-1.03284	-0.66568	-0.71219	-3.84E-02	0.871185
-2.03226	2.38065	1.20004	-3.35837	-2.03589	0.302032	-0.77719	0.787323	-0.7366	0.38147
-2.17743	0.775726	-2.55038	-2.58459	-1.88104	0.407776	4.58E-02	1.94519	0.289703	2.59656
-3.78806	0.376251	-0.15863	-3.58237	-2.45212	-1.38098	-1.3613	0.693359	1.18439	1.55145
-2.81226	-1.63852	-1.61292	-1.11212	-2.96738	-2.51224	-4.69128	2.22665	0.940582	-2.3241
-1.02402	-1.55896	-4.65771	-2.4751	-2.25491	-0.74854	-2.86346	1.95038	-0.35172	-0.59872
-2.91409	-0.20383	-1.86063	1.67291	-1.47501	-4.29996	-3.66696	-0.74561	0.370178	-0.4725
-2.31418	-1.93555	-0.2096	-0.39264	1.15762	-6.13571	-0.3053	-0.1145	2.34338	-2.99097
2.66376	0.612183	-0.73254	-3.40201	-0.12787	1.43341	-0.98889	0.86261	1.35867	-5.46564
-0.39813	-0.63348	-4.47943	-9.14731	-0.2836	0.329254	-3.25278	5.01483	7.25E-02	0.163727
1.5784	9.91E-02	-4.34509	3.08588	1.06253	5.6954	-1.16727	-0.93054	-2.60406	-1.42929
1.02103	-0.15509	-5.7883	1.612	-3.84048	-1.62125	-1.93167	-7.59E-02	-0.33884	-1.62564
-1.5311	1.15842	0.648376	-3.01218	-0.52615	0.177277	-1.9632	1.64252	1.42142	-3.1391
-0.62778	2.69885	1.70096	-1.38608	-2.26028	0.149139	-1.0994	1.77493	-0.44513	0.203979
-2.3157	2.62854	0.908417	-1.35449	-2.27234	-0.95084	-1.73212	1.4686	0.862213	-0.33237
-1.56125	-1.13025	0.425873	-1.29248	-2.61551	0.617401	0.2854	1.75406	1.65018	-0.50555
-1.91803	-1.00391	-0.57779	-1.56601	-3.02997	0.411255	-1.93878	-0.88904	1.68149	-2.0394
-2.58032	-9.33E-02	-0.59131	-2.08823	-0.27481	1.11435	0.422943	-0.19434	-1.11673	-2.91983
-0.57349	-0.28882	-4.05933	-0.29221	-3.87811	-1.33755	2.77356	-3.67499	-2.5332	0.435791
-1.11627	-2.00195	-0.6247	-6.95044	-0.48367	-0.34631	-5.52411	3.07278	2.06699	2.66135
0.607056	0.470795	-1.29443	3.29727	-1.26266	-1.09918	-1.88138	1.89081	-2.37302	6.30124
1.17636	-1.06586	-2.32483	-0.81522	-0.52509	2.33646	-3.27908	4.99573	-3.21558	1.74033
1.55682	0.369293	0.865204	-3.4649	-1.59406	-0.21509	0.79184	3.45676	1.93E-02	1.341
-1.0925	-0.67587	-4.65411	-4.0596	-2.63806	-3.45215	2.03363	0.495819	-0.95163	-2.11633
-3.27072	0.382324	0.718567	-3.61075	-0.93414	0.277771	-1.20029	-0.34479	1.37653	-2.03629
-2.21027	2.64594	1.46945	-2.45367	-0.90228	2.46362	-1.08179	-0.46216	0.617279	-1.84113
-1.79312	6.38E-02	-0.34518	-3.43399	1.36356	1.93146	0.73288	-0.9122	-2.2291	-2.58276
-0.37045	0.772034	-1.61331	-1.09879	-0.71823	0.924011	-0.88361	-1.49155	-1.6344	-1.52585
-5.72736	0.292694	0.187805	-0.8671	-1.04227	7.16E-02	-2.69528	-1.72464	0.432983	-1.89789
-0.30533	-1.18597	0.208069	-0.40183	-0.68442	0.467255	0.397034	2.14297	-0.22543	0.31427
-1.66351	-0.75992	0.905365	0.389404	0.28241	4.05005	2.70905	-2.2692	3.86328	-2.56439
1.52573	2.70895	-0.82999	1.49716	-2.28415	0.697174	-7.69589	1.73718	-5.20E-02	-1.88306
2.45566	1.59628	0.955841	4.77087	-0.38657	2.24393	-2.83679	2.98331	-1.95154	-3.34845
6.77E-02	-2.17828	-0.71655	-1.1488	-2.98E-02	4.51288	-3.06906	-0.29297	1.52292	2.91113
-1.79929	-1.85062	-3.98007	2.59769	-3.28027	3.86423	-0.35275	0.595459	3.12723	-0.8938
1.81293	2.31873	-3.56201	-0.24551	-3.30478	1.43915	0.644135	-8.11E-02	1.51675	-1.62683
0.158203	-1.24298	0.294281	-1.82288	-0.77237	1.47256	-0.72519	-0.92459	0.744507	-1.38861
-1.01978	2.05066	0.941254	-1.05048	-0.59189	-1.41818	-1.05899	-7.03E-02	-0.3396	-1.95273
-1.72141	1.57013	-0.49988	-1.65771	-1.46115	-0.85092	-1.99054	3.03711	3.01E-02	-1.32184
-2.89655	1.33975	-2.41721	-0.13577	-3.34033	-6.86E-02	-1.15738	-0.81183	1.25339	-2.19836
-4.58484	-1.23251	-0.87909	-0.1955	-3.80997	0.329254	-0.77228	-1.31583	-1.65509	0.473602
-1.80353	0.534851	-0.85443	-3.08E-02	-1.06729	-0.75256	-0.33496	-2.09143	-1.20892	-4.33853
-2.5174	-2.91403	0.10437	-2.52921	-1.17792	-0.59924	-3.70526	-2.3165	-9.84E-02	-4.37939
-6.61478	-3.92587	-4.32367	-1.18854	-2.65607	-0.85782	-7.5499	-2.436	5.65939	-2.82837
-0.32474	-1.28052	-2.03235	3.65408	-1.33856	0.991211	-5.32761	-0.14389	1.54279	3.09686
2.14536	-1.83047	-5.05093	2.23749	-3.1178	-1.26743	-3.70236	4.73053	0.74823	3.47153
-3.32489	-4.29233	-7.62817	0.343781	-2.10876	4.90152	-6.45386	4.36435	-1.69339	1.43762

-0.80719	-4.02548	-3.06531	-5.31E-02	1.64584	-0.79575	-0.98126	0.511902	-2.09305	-1.83743
-4.06262	-1.2092	-0.44342	-1.78E-02	-3.27747	0.460663	-0.80399	1.02151	0.239227	-2.49719
-0.54797	-7.84E-03	0.59906	-2.28668	-1.3172	-0.42886	0.267303	1.07895	0.829987	-2.80881
0.325867	2.12103	1.74991	1.24579	-2.14734	-0.55512	-2.16522	1.85199	0.682007	-0.76267
-1.52835	-1.86285	1.46957	-2.02408	-2.44501	-1.05328	-0.32181	0.908661	-1.61951	-1.90576
-4.57355	-0.41202	-0.33011	-2.194	-3.15155	3.70474	0.802612	-0.11823	3.1821	-2.6871
-1.51852	-0.65436	-2.47003	0.418182	-3.10339	2.47565	-2.02E-02	0.286865	1.18256	0.359467
-1.59409	-0.11871	-1.54803	-6.45E-02	2.06079	0.521942	-1.18115	2.138	1.52487	-0.14179
-1.69849	2.79025	-2.78879	-2.67307	1.37823	3.76538	-4.01199	3.86661	-5.37549	-3.10034
1.37228	-0.75201	-5.16745	4.7995	2.76584	-1.06287	0.112701	-3.50259	6.68976	-3.24435
3.74255	-3.69708	-4.49414	0.9888	4.8624	-1.93713	-4.01569	-1.86237	3.45795	-6.51697
-2.4357	-6.43732	-5.19128	1.4025	2.05362	2.6181	-0.10617	0.902161	5.68002	1.72482
0.631714	-4.69629	0.648285	-0.89322	1.79214	-0.44424	1.13104	3.59991	1.53665	-1.76074
-2.18912	-0.66269	1.21686	-1.03177	-3.30844	-1.00363	-1.5174	1.80081	-1.84E-02	-2.5293
-1.91528	1.13495	0.33316	-3.32239	-3.4726	0.221619	-0.44989	0.807831	-0.96652	-1.58841
0.460968	2.15363	0.721619	-1.46939	-2.23764	-1.68414	0.27948	2.5621	-2.05728	-1.17975
-1.14026	2.53784	0.135773	-0.64017	-1.68542	-1.491	0.486816	1.84125	-1.8754	-1.07037
-2.66974	-0.39221	-1.32019	0.228302	-1.80087	-1.02374	-1.85217	2.17526	7.84E-02	-2.1792
-2.60092	-1.79517	-2.43372	5.33E-02	-1.94931	-2.14304	-3.17587	0.785187	1.48566	-1.75662
-1.1687	-0.25742	2.53348	-1.29449	0.8927	-9.38E-02	1.60986	4.00281	-1.0816	-1.05069
3.42984	-1.71347	0.24881	-0.88165	-0.28638	-3.89911	-3.40289	2.3822	-0.729	-2.25177
1.19678	0.494995	-0.82275	-1.81662	2.74042	-1.88947	-1.08829	-0.6832	-3.72891	-2.12335
2.43826	-2.72849	-0.47894	-7.63879	4.246	-1.23944	-5.83E-02	5.15863	2.51105	-4.83148
2.45532	0.156677	-0.45837	-2.20041	-1.49377	-2.02469	0.401947	5.22687	-1.91507	-5.36179
2.39511	1.15952	0.967987	-0.75342	-0.21616	-2.42123	-1.91876	1.4292	-2.49844	-2.14453
-0.49402	0.66391	0.652374	-2.27206	-0.60495	-0.61194	2.00702	0.500824	-0.47299	-4.5126
-0.66437	1.34464	0.941559	-1.84399	-2.7525	-0.82416	0.308685	0.901642	0.457977	-3.20251
-0.15271	2.10263	2.52921	-2.24069	-1.51105	-1.12164	0.258484	1.47519	-1.3407	-2.63794
1.36444	0.411926	1.55679	-1.39749	-1.69833	-2.30469	-0.12338	0.578064	-0.51471	-2.36996
-1.13754	-0.81082	-2.51389	-1.3349	-1.03006	0.117645	-1.79126	1.89175	0.164795	-4.84641
1.16098	-0.77856	-2.22672	-0.76492	-1.14279	-0.37454	-0.59058	-1.06583	-1.49722	-3.08722
1.08209	-1.09384	-1.18042	-4.5415	-0.8367	-1.02063	-0.60696	2.09479	2.45657	-7.78821
3.89752	-2.77036	0.517914	-3.60294	1.92773	-0.2196	-1.23621	3.90939	1.45761	-2.52597
-0.66592	-1.2005	-1.80273	-4.62622	1.04352	-4.97299	-0.94409	4.93341	0.392761	0.936066
2.45935	-2.94708	1.37247	-8.9501	1.97662	2.36047	-6.97568	2.63251	0.546326	3.65851
-0.64279	-2.56573	-3.44867	-1.16791	0.120239	2.23273	-2.42645	3.32587	2.83511	3.1619
1.07553	-5.20868	0.462402	7.22E-02	2.32062	-9.57E-02	-3.30618	0.429993	1.57346	2.32248
-0.7374	0.337524	2.30176	-2.01675	-1.72714	-0.68973	1.86072	1.92282	-5.07E-02	-0.59979
-1.04477	-2.55356	1.95914	-9.18E-02	-0.95358	-0.17798	-0.45972	1.13043	0.756073	-1.27063
-2.45703	0.991821	1.80692	-1.1398	-1.61664	-4.29E-02	0.455383	0.275604	-0.5354	-0.91486
-0.78534	1.15094	5.46E-02	-1.12799	-0.99094	1.92261	-1.5191	0.718964	1.83029	-3.73785
-0.33554	-3.39252	0.55899	-1.6282	-1.48456	2.47446	-0.27518	1.23618	-0.54831	-4.2583
-2.56723	-4.70477	-0.17911	-2.8233	0.835907	-0.29984	-1.58606	2.60019	-0.77634	-2.02942
-2.71231	-3.47113	2.22528	-1.4791	-0.74301	-2.77795	1.95676	2.38199	4.59857	-2.73981
-0.91779	-2.10916	1.0762	1.54025	-1.64E-02	-0.8439	-5.50558	2.68649	4.12479	-2.67917
2.59827	3.49561	-2.16425	0.417877	-3.86948	-1.98428	-3.3428	-2.7052	3.44449	-4.36154
2.20364	2.16464	-2.78424	-0.31751	-0.61719	-1.52643	-3.90817	1.96811	7.34253	-7.05829

-0.3765	2.13278	-1.03137	1.01968	-1.15808	0.298706	-3.27356	6.26157	1.99881	-1.08679
-3.69867	-2.26218	0.455383	2.431	-2.08417	-0.84125	-2.95676	0.95932	0.396667	-2.46124
-1.72571	-1.40308	-5.23E-02	-0.55756	0.638733	5.60E-02	-2.48938	-0.83969	-0.16287	-2.43829
-0.44489	0.752258	1.76715	-2.77478	-0.67261	-0.92648	-2.02359	4.95093	2.14349	-2.49722
-2.07281	1.28482	2.18372	-1.07019	1.28E-02	-2.62E-02	-1.78052	3.57581	1.11859	-2.86295
1.26917	-0.74716	-0.89121	0.202423	0.223175	-1.62738	-2.1022	1.77237	0.831604	-3.33276
-0.68805	-0.29102	-1.8078	-1.8035	-1.83136	-0.70343	-2.93799	1.99127	-0.8454	-2.77899
-2.33383	-0.97138	0.473267	-1.95932	-3.91202	-1.66434	-0.10446	2.14688	-2.13513	0.328979
-1.2489	-0.29263	1.28036	-0.37851	-1.68311	0.49826	0.49884	9.58E-02	-0.73972	1.2482
-2.49768	2.29123	2.12201	0.156738	-2.04486	-5.42853	-1.2135	2.7215	-1.27039	3.02063
4.92398	-0.58429	3.62677	-3.46811	-4.01547	-3.18246	2.6842	-0.16168	2.12448	1.77274
3.75436	0.409729	2.31226	-0.70441	-6.78E-02	1.70386	1.92844	-4.39297	-3.63635	-1.71289
3.9906	2.89178	-1.86609	1.3877	-4.76978	4.36963	-4.72296	3.38446	-3.79977	4.72742
-1.08038	1.24551	-1.65771	-4.35321	-0.75107	0.900452	-0.75739	-0.4653	-2.86176	1.81738
-5.50E-02	0.737213	-0.28333	-4.42056	-2.02057	0.318176	-3.16	0.869812	-0.36328	-0.28861
-1.74927	-0.42737	1.44394	-2.61819	-3.23291	1.09943	-1.88629	0.991425	-1.10132	-1.59592
-0.69803	-1.51E-02	-0.10989	-1.32629	-2.28644	0.860779	-1.68463	0.158417	1.1395	-1.93066
-1.00125	0.713531	-1.59793	-2.06458	-4.33713	0.863403	-0.40289	2.02496	-0.8804	0.594238
-2.44675	-2.11243	-0.83179	-1.3541	-0.46268	-1.45013	0.21463	1.38855	-0.19891	-0.66959
1.89249	0.281952	-1.32193	-1.9191	2.0614	-6.65E-03	-0.41986	-8.51E-02	-0.47464	-1.89163
-4.72729	0.165863	-2.50504	-2.9389	-0.31561	1.62436	-2.24054	3.85071	2.82397	2.34741
-0.83087	0.207245	-0.51477	2.68906	1.23E-02	2.22928	0.526611	3.10788	1.4473	-1.60144
1.47437	0.620911	-2.70035	-0.91013	-0.71988	1.20673	2.80951	3.6951	6.41406	-3.24545
0.791443	-3.32547	-0.51996	0.452698	2.79202	-4.96915	-6.94006	0.206116	2.41675	-6.91849
0.195801	-0.22434	-2.1503	-1.6795	-0.27167	0.582306	-2.32117	1.38687	0.586426	1.77972
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-3.06631	0.601898	-0.65314	-3.44617	-5.44E-02	0.903564	-1.51981	3.27652	1.57874	-2.1041
0.549316	1.91064	-1.80035	-2.43329	-1.6015	0.609741	-1.5647	1.76852	-1.5809	-3.62311
0.593475	0.479034	-0.57718	-1.48102	-1.25446	-0.33652	-1.99374	1.4881	0.842194	-3.50934
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-2.08301	-1.95352	-1.30124	-1.2746	-2.522	-1.59045	1.18906	-0.26459	1.0228	-0.39261
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3.77933	-1.11755	-5.70157	1.87756	0.524841	-2.24631	-4.159	-1.03342	0.567108	-0.89966
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2.88873	-0.24786	-1.68567	-2.61844	-2.14145	-0.64111	-5.45169	1.6731	0.561401	0.243439
4.54407	-0.8609	-3.51294	-0.90482	-2.51166	-2.99689	1.76721	5.03842	-1.85443	-0.23944
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1.86853	-0.97366	0.551605	-1.40421	1.59592	-1.20703	1.28314	-0.55899	0.67926	-2.11E-02
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2.29987	0.483734	-1.21872	-0.41132	-1.41589	-2.53635	2.28955	0.935669	-2.27353	-3.52191
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4.12628	-1.9339	-2.33664	-4.17822	1.95874	-0.86807	1.00931	1.75381	0.849487	4.05695
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1.58517	-3.78137	-1.89001	0.956787	1.1785	0.840057	2.17712	-1.55093	2.26166	-4.63422
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1.03436	-2.00137	-1.21036	5.0589	1.36261	-1.58972	-0.34967	-0.62738	6.25882	-5.95087
-3.2016	-3.71921	1.91962	3.65457	-1.03348	-3.91238	4.07245	0.679047	4.96793	-2.77869
0.417114	-2.61707	-0.496	-4.00681	-3.27518	-1.61035	0.279938	0.769012	5.22855	-2.03522
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1.28284	-0.46655	1.26862	-0.81644	-2.48657	-3.40253	-3.32928	0.853088	4.16141	-4.43875

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0.5802	0.783966	2.07587	-2.0585	-1.30731	-1.90726	0.751953	-0.66419	-1.04852	0.170013
0.111511	-1.74805	-4.84698	2.41406	-2.29456	-5.43161	-4.94809	0.150696	-2.21249	-3.62726
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2.69E-02	0.290527	-2.51605	1.66449	-3.01419	2.05026	-1.19067	2.66962	-0.51526	2.36172
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1.05823	-0.41187	-4.9191	-1.66772	-0.94437	-0.61194	1.11694	-0.52161	2.46405	0.383057
1.2081	-1.49759	1.98016	0.705048	-0.49054	1.40808	-1.06598	0.24881	1.02621	-2.64182
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0.600281	0.217316	1.71292	-3.37411	-1.97363	-1.28033	7.57E-03	-2.66919	-1.09189	-0.73294
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3.99216	4.21548	-2.12103	-1.7276	-0.30988	-3.74188	-0.51801	5.64722	7.27518	-1.73026
3.07877	6.38684	-1.42496	-0.5621	0.361725	-4.80194	-6.37558	4.23093	2.45883	-1.44189
2.12E-02	3.00238	-0.84497	-1.19943	-0.55438	-3.88428	-0.96436	-1.02505	4.18082	0.697998
-1.4278	-1.86798	-2.87192	2.23148	-0.16779	-2.22925	1.38873	0.586121	1.04156	-2.24564
0.605774	0.307007	-0.42072	-0.68906	-0.31525	-7.00E-02	-1.51498	0.463623	2.16351	-1.0575
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0.348297	-1.39694	1.48636	-1.26971	1.56561	-2.62064	-2.74765	2.04349	0.634491	-6.0997
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5.00256	2.62891	-0.24185	5.5701	-2.01556	-6.52637	-2.32538	5.1882	0.462067	1.36026
-3.19205	-0.81998	2.96884	5.16641	-1.02988	1.94928	-2.32047	-1.21207	2.93903	-3.18918
-0.91827	-3.03461	4.3208	1.54028	-3.05606	-7.18567	-1.49847	2.41095	1.79932	0.163116
-1.36539	0.479309	-1.25381	-3.55341	-2.60876	-2.69644	1.63641	1.73239	2.38315	0.828674
0.652893	2.7847	0.727783	-0.13617	0.544952	-1.63962	-1.65829	0.310028	0.252411	-0.51129
-0.61307	3.16183	1.72394	-0.27039	0.759491	1.55234	-2.18729	-4.15E-02	0.511475	5.55E-02
-1.6907	-0.81198	1.51321	-1.09631	-1.64163	-0.49484	-1.06134	1.48099	1.63501	-0.64154
-1.87015	0.361237	0.837677	-0.85837	-2.98663	1.70172	-2.44479	-1.43134	2.8493	-1.75235
1.87427	-4.69711	-6.77E-02	-1.3634	-5.65225	-0.63724	-2.90659	1.17456	0.825409	-1.06198
-0.44693	-1.55246	-4.19611	-1.94681	-2.7186	-0.73615	0.894226	-2.27274	1.41898	-5.41544
-0.3403	-1.41522	0.369354	0.302185	-1.66449	-1.34604	-2.30774	-1.5509	1.42258	-2.3656

-0.25366	1.94376	-0.5286	-5.79565	-0.69318	1.90948	-4.82721	-0.19711	-1.59079	-6.09415
-1.92963	-0.22852	-7.54E-03	0.13797	-2.71988	-0.80447	-6.25101	5.55701	1.08688	-0.80924
-5.24396	-1.64227	2.34436	2.5571	2.00201	-4.16882	-2.32037	2.65604	-0.46475	-6.86328
-2.91739	0.442291	-2.2782	2.63449	-4.81848	-2.93808	-4.47937	0.406372	4.08841	0.908722
0.394318	2.53613	-1.86011	-2.16901	-1.40567	-0.18955	-0.91666	-1.5596	-0.70255	-1.08542
-0.2428	4.1814	0.546173	-0.13437	-1.77567	0.244781	-0.58301	-0.18979	1.49643	-2.92899
1.67233	1.65784	2.84534	0.330902	-1.1712	-0.13266	-1.62439	0.744843	0.132599	-1.58243
0.333496	-0.28937	1.3428	-1.4675	-1.02286	0.368683	-1.82544	0.915802	-0.13831	5.44E-02
-0.23624	0.901947	-1.11981	-1.91849	-1.00931	0.479797	0.21402	0.725769	1.7673	-2.55096
-3.05743	2.32858	-2.93069	2.17E-02	-3.01196	2.43704	-1.73209	-1.68994	3.29599	-4.75958
-1.78772	-2.08215	-1.61261	-1.5076	-3.0834	1.87564	-0.16455	0.988464	-0.32642	-2.70E-02
-1.34421	0.55957	-1.08875	-3.03079	0.591888	-1.60165	-0.78687	-1.51678	1.30728	-3.73898
0.180634	1.75793	0.778503	-8.33276	-3.37225	-3.7023	2.6059	3.27859	3.59338	-3.74625
-0.21762	2.97339	0.942352	0.123291	-1.25067	-1.14508	-0.93478	0.97641	2.08438	-2.35974
3.39246	2.43723	-0.62314	-2.34909	3.07501	-3.75262	1.07553	1.32172	-0.95847	-6.11227
-0.142	-1.04233	-3.0542	-1.02283	0.201324	-7.30E-02	-1.01587	1.23145	4.76532	-2.86069
1.35031	-4.42017	-0.35822	1.42047	-2.87366	-2.64563	0.36792	-0.77438	1.28925	0.342285
-2.86E-02	0.510406	0.374573	0.301727	-2.88336	-1.19034	1.31482	-2.2746	0.26413	0.100311
-2.08206	0.347931	1.87265	-0.22138	0.298096	-1.12698	-0.50299	-0.47946	3.07309	-0.73282
-1.8558	-2.47E-02	1.52762	-0.82901	-1.84955	-1.07562	0.726868	0.516998	3.4321	-0.10336
-1.81934	-0.58246	2.24637	-0.84628	4.67E-03	0.514923	-1.41858	-0.27216	3.25668	-1.52646
-0.19824	-0.91611	-1.9949	-0.92542	0.79715	-1.23495	-1.98816	2.45087	5.05618	-2.6658
-1.51901	-0.31366	-1.02042	-1.27692	-2.17709	1.19656	9.83E-02	-1.15561	0.987976	6.21E-02
-1.23569	0.248077	-1.17062	-3.97562	-2.4509	0.596344	-0.50845	7.37E-02	0.983795	0.625793
0.233826	-3.08786	-2.78738	-1.67017	-1.95087	1.31918	-0.93509	1.0488	-3.57571	-0.38104
-1.77234	-3.09952	-2.13925	-0.8591	-1.72128	-1.02499	3.75079	5.81421	0.638458	-0.77896
1.75446	-6.98428	-3.67984	-5.33292	0.399597	-1.00082	-2.56088	6.13983	2.77E-02	-2.52948
2.42511	4.47217	-5.71979	2.52228	-1.81317	-3.41718	1.43973	1.74365	1.28891	-5.7644
1.06433	0.594421	-2.1781	-7.22E-02	-1.37067	-2.43484	-3.00327	1.4772	0.714661	-0.52234
-1.4118	1.01071	3.51328	-2.20795	-1.47086	-0.30423	-0.79111	1.52341	-2.91E-02	-0.56091
-2.17038	1.44583	-0.34296	0.63092	-2.19629	-1.20557	-1.909	1.05612	-0.64481	-0.56693
-0.21912	0.554932	2.03091	-0.8316	-1.93784	-1.35004	-1.85202	2.03839	1.28281	-1.98254
-0.15424	-0.25397	1.12607	-3.01337	-3.73892	5.51E-02	-2.35568	2.59485	2.44128	-1.31705
-2.27353	0.733795	1.1716	-0.97781	-1.06805	-2.16974	-2.46567	0.551575	-1.28E-02	0.962006
0.558563	-1.99835	1.63489	-2.90152	-0.36929	-6.09E-02	-2.82938	2.34448	-0.96063	-0.70862
2.85071	-1.01364	-1.58493	0.627686	0.111694	1.75424	0.631653	6.50E-02	-6.6972	0.848816
-0.93668	0.690033	-2.14859	-5.35284	-0.49985	4.48718	-1.061	-2.8241	-5.48071	0.43634
-2.10532	-2.76669	-1.84366	5.67477	2.40454	-4.28848	2.0231	2.10132	-0.89313	-4.62604
3.68945	-4.15088	-2.41196	0.228302	0.889221	-1.35425	-4.32129	1.59103	-2.07147	2.16782
-0.8143	3.70239	2.5574	2.63339	-1.67758	-0.20548	-5.32095	0.223267	-0.62698	-0.52588
1.54681	-0.47018	2.35449	1.74127	-4.14807	-0.39224	1.39832	8.58E-02	-0.95316	0.640656
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-2.22662	0.505219	1.37283	-4.3931	-1.29935	-9.92E-03	-1.33762	0.942902	-0.5874	-0.75046
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-2.65973	2.672	-2.99841	-1.8537	-4.06387	-1.24344	-3.27316	2.79977	-1.69241	4.08E-02
-2.26553	-2.29E-02	1.87E-02	-1.7587	1.48651	-2.82944	1.77863	-0.63474	-0.39392	-4.03741

2.91101	-1.07281	-3.12674	-0.9628	0.765686	-5.12445	-2.09735	0.708496	0.719391	-2.7966
-1.13E-02	1.25763	-1.99759	-1.43607	1.32034	-0.1387	-2.93109	-0.5911	1.71191	3.88E-02
2.99356	6.36E-02	-0.36844	-2.621	-0.24509	-3.90747	-5.81329	0.352722	3.17487	0.626038
5.63547	-2.58167	-2.55075	1.26428	0.570496	-0.27115	-3.09229	3.44241	-0.93256	-0.46579
0.772614	-0.66763	-5.52377	0.676971	1.40402	1.44293	2.69595	3.61325	-1.76288	5.38071
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-0.49802	-3.30447	0.911255	-3.36096	1.12265	1.07977	-1.3847	0.494324	0.370819	-0.88779
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-2.86765	-0.20441	-1.01501	-0.67432	-1.88898	2.41846	1.12372	0.158966	0.379486	-1.853
-0.99973	-0.57617	-1.11234	0.864777	-2.9736	2.69516	-0.36667	0.372162	-1.49243	-2.51703
0.818909	0.450287	2.49677	1.18161	-1.40021	1.10776	6.95E-02	1.58499	-0.76492	-0.4668
3.86792	-0.21945	-2.96E-02	-3.38995	-2.80215	1.7489	1.7731	1.5914	2.83371	-3.30975
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3.24496	2.45413	-2.87024	1.32809	1.22351	8.98517	-1.58847	1.78632	2.56613	2.05353
1.92111	1.65479	0.616516	-8.85E-02	-1.15506	-1.91089	-0.35315	3.19016	-0.12659	2.2478
2.08322	0.946533	4.54E-02	-1.41702	-2.33716	2.48367	0.209534	2.08762	-2.30444	-0.44022
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-0.86655	-0.46787	-2.11893	-0.75449	-0.17252	1.892	0.702515	1.62326	0.589691	-0.34885
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0.261292	-2.06494	-1.36154	-1.6781	-0.8815	-2.86154	-2.02704	-2.7381	-0.24213	-1.83099
2.03003	1.90134	-1.49088	-6.94135	-0.57385	-1.81311	-0.59641	1.5401	-1.97711	0.938232
6.70398	0.748291	-1.43463	5.88687	-6.33E-02	-4.29947	-2.37848	4.87622	1.67297	-0.73825
1.38126	4.33554	1.84854	0.659912	-0.9036	-2.57394	-7.24869	3.57803	-1.84927	-5.36859
1.81012	3.77878	2.55841	1.91119	2.65143	-4.74759	-3.96356	5.19894	3.20633	2.68182
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0.129547	2.30188	3.54361	-2.81	-1.35855	1.68735	0.158813	-3.04135	3.07E-02	-0.30631
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2.88736	-8.17148	1.35196	-1.46039	-1.70398	-2.80344	1.38391	3.35092	-1.23758	-5.61349
1.52921	-4.63013	1.85941	-3.61792	-1.13586	-0.70309	-4.43265	2.34537	0.851135	1.33432
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1.03439	3.34732	1.54037	-1.82425	-1.20825	0.37088	0.474304	-0.10489	0.419525	0.950592
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-0.61417	0.167755	-0.35819	2.29324	-6.23825	-2.23651	-3.0834	0.562286	2.9931	-4.48724
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0.541809	0.174927	2.729	-3.01312	-0.60538	-3.69394	2.00684	-0.10419	-0.30634	-2.41412
0.592804	0.819305	2.53476	-1.66565	4.53E-02	-1.84634	-1.18921	-0.87048	-0.20377	-1.47971
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-5.95E-02	1.59064	0.338684	-0.34311	-3.58139	-2.49026	1.64514	-1.69614	-2.55234	1.43198
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1.04608	5.21811	3.55255	-4.8038	2.30234	-1.65826	-0.81189	-2.71948	3.58539	1.11084
5.25174	2.79184	-1.19345	-1.1387	1.18121	-3.69745	0.380615	2.54224	-2.23108	-5.31497
2.4357	0.579987	-2.00049	-0.16922	-1.54767	1.06491	-0.60165	1.54935	-1.30856	2.27911
3.52661	-2.25998	-1.0087	-3.29822	-3.60388	-0.92224	-1.02798	-1.33591	1.85855	2.31818
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1.16904	2.10455	-1.08392	-0.20459	-2.26651	-0.58429	-1.23828	0.856354	1.11359	-1.26086
2.33817	2.20947	-0.27609	-3.09982	-4.23096	1.77914	-2.19498	-8.27E-02	-0.70831	1.9129
-1.74362	0.157837	0.546265	-1.99652	-2.10629	-8.15E-02	-1.53156	1.57037	2.17868	1.06287
0.255493	4.03018	-0.57382	-3.58942	-1.20221	-0.86923	-1.01996	-0.40781	-7.72E-03	-1.92249
1.62433	0.459656	-1.65948	2.74454	-1.29196	0.816895	-5.27209	-1.53461	-2.96561	0.812836
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-0.3512	-0.64578	0.322357	-2.58926	-2.87766	2.47498	-2.06619	-1.48318	2.26233	-2.81201
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-0.37933	-8.20E-02	1.423	-1.44901	-0.54706	1.96417	0.834259	2.06052	0.870911	-0.74985
-1.79803	0.877228	0.431976	-2.18176	-2.35382	3.12082	0.277191	1.49756	-2.1264	-2.83646
1.70056	-0.9386	-0.56632	-1.02441	-2.50046	2.79504	-3.77097	0.544647	-1.1275	-7.15E-02
-0.24252	-1.96057	-0.37552	-1.15952	-0.49539	0.321564	0.447327	-1.34903	1.47379	-3.16391
-0.56351	1.57397	-1.01132	-1.98099	0.974792	1.20584	0.759735	-3.65649	3.43878	-0.66861
-4.22708	3.64203	-6.35797	-3.30505	1.73312	2.43399	-0.45468	1.4382	1.207	2.86414
-0.88464	1.0394	-3.99405	2.9274	-1.99908	-0.45288	-2.35138	3.59421	-2.53561	-3.21536
1.14255	-2.80768	-1.73184	2.43369	-4.88538	1.38196	-4.36917	3.97162	1.47314	-0.94327
0.37561	-2.60114	-1.73148	0.197174	-3.97028	-1.38809	-2.49005	3.96417	4.40854	-1.4184
-3.56839	-2.36227	0.86499	-1.2171	1.14673	-0.37314	-0.24368	0.298492	2.47015	-2.78543
-0.64282	-0.3797	2.72006	-0.48935	-0.44174	-3.17813	-1.57898	-0.44959	0.706909	-2.12491
-3.14786	-1.53287	-1.08096	-0.77759	-1.62561	-0.77237	-1.95181	2.26422	-0.18393	-1.03882
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-2.80334	-1.87192	-3.13199	-4.22882	-3.44077	-0.74866	-2.78107	0.175873	-2.10031	-0.3493
-0.44214	-3.02536	-1.91702	-0.9863	-1.91159	-1.01276	-0.11975	-3.01462	-3.59622	-2.44193
-1.15829	-1.54602	-1.95682	-3.59479	-2.03781	1.78E-02	2.18744	1.3042	-1.60571	-3.93909
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-2.71072	-1.07431	-2.57983	-2.2142	-3.81567	-0.18707	1.73212	-3.69678	4.83359	-3.20425
0.828552	-7.07907	-3.11295	-1.86661	-2.06149	3.05917	-2.43607	-0.55618	4.98102	-4.27838
-2.27267	-3.95163	-1.39407	-1.35742	-2.34756	0.914917	-2.91406	-1.65265	3.71063	-4.43268
-0.20108	-1.94547	-0.10269	4.01E-02	-3.42117	6.40E-02	0.19104	-3.056	1.58716	1.57977
-2.2373	-1.8288	-2.34073	-1.95605	5.36E-02	-0.34723	-0.61438	-2.19629	-1.53278	0.292389
-3.57227	-6.95E-02	0.851044	-2.67938	-0.801	-1.38837	0.69339	-1.39847	0.32309	0.167389
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1.94656	-2.9295	-1.08139	-2.1821	-2.08856	-1.47723	-2.89658	-0.51584	-1.38602	-3.01041
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4.30212	0.82663	-2.31967	-1.88504	-2.62466	2.31378	-4.3436	2.44058	-2.08829	1.17294
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0.127411	1.66229	-4.11407	-4.36502	-2.96597	-1.21359	-5.46146	2.01895	4.15521	-0.97
1.7937	-0.23358	-3.46249	0.311676	-8.53766	-1.23694	-7.57E-02	1.8598	4.73935	2.51947
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3.11346	-1.74796	-0.46121	-0.8204	-4.2493	0.68515	-1.14056	-0.49362	0.702972	-1.95331
0.626099	-3.94183	1.01517	-1.7222	-1.37521	-2.52133	0.29834	-3.29221	1.29608	-1.15768
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1.02536	-4.17999	1.40247	-2.29993	0.581329	0.689117	0.433411	3.3819	1.77118	-4.16425
2.83136	-3.64697	-3.43484	-3.11072	3.7403	4.36356	2.63443	2.01111	-4.40518	0.812927
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2.41162	-4.15848	1.03879	1.67749	-1.04047	1.35477	-0.32929	-0.44611	1.08777	0.849579
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3.31696	3.2756	-0.65476	2.58908	0.445923	-3.33939	-2.0069	-1.27948	2.19986	2.19315
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2.28E-02	0.811737	-0.96243	-1.42188	-1.39731	-1.95309	-1.67538	-1.09274	0.686096	-0.34256
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1.14114	1.96262	-4.44434	3.11801	4.33032	-7.29245	-2.65576	-0.29157	-0.64496	-3.97659
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0.205139	-5.50656	-2.22433	-1.7016	-0.608	1.19815	-1.22278	-2.43716	-2.20135	-1.78998
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1.37646	-1.81097	-2.09161	-4.2894	-0.7063	-0.42975	0.479248	1.48767	-2.37222	-1.10242
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3.18793	1.31964	-2.49329	-3.14624	0.618225	-4.62271	-1.55579	-6.95889	2.1402	2.66486
4.06186	-1.98032	-3.72873	-0.96921	-1.31458	0.319336	0.9711	-0.7822	-1.37183	-2.84015
0.219452	0.353119	-2.37875	-1.6257	0.824097	-1.40094	-1.75558	2.37643	1.13583	1.66492
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9.28E-02	-2.34186	0.115326	-2.37625	-4.18265	-1.07111	-4.2641	4.25989	1.4165	1.69925
2.64078	0.589508	-1.80203	-3.94452	-1.47968	-1.28448	1.02722	-0.5491	3.90057	2.07416
3.27496	-4.10538	-2.58356	-2.30469	1.035	-3.24503	-0.15347	1.01263	2.70392	5.42313
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1.09232	-1.01328	-1.2529	-2.02802	-2.90848	-2.87683	0.996429	1.62E-03	-0.31525	3.24878
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-0.46735	0.7659	-2.246	1.23999	-3.36536	0.527771	-3.21817	0.489349	2.28571	0.43042
-2.34091	0.793945	0.756866	0.557098	-2.5972	1.38434	-0.32385	4.19006	-2.30664	0.246765
-3.02689	2.18518	-2.43774	-0.69949	-2.0994	2.55475	5.70E-02	-0.52649	0.39978	-0.97699
-5.49869	0.506439	-2.60849	2.12546	-3.25345	-6.36462	-1.6839	-5.57919	-1.0762	3.40945
-0.46893	0.14801	-2.15744	2.4968	-3.41757	-3.65927	-7.7529	-0.94589	-8.44E-02	-2.16745
-1.56143	-2.17429	-2.60596	2.3555	-4.64978	-2.22864	-2.31119	1.94254	3.64383	1.19293
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-3.98059	1.43073	-4.70392	-2.45081	-2.07816	-1.05032	-0.92197	-0.81128	0.331543	1.70816
-1.35001	1.39761	-2.73724	-2.16656	-0.52365	-1.22632	-2.6192	0.814117	0.545715	1.85339
-3.53006	-0.48456	1.41824	-1.12119	-3.6925	-2.64456	-1.6264	-0.42065	2.54968	-1.92163
-2.23041	0.332916	-1.6088	-0.6427	-0.47604	-1.10303	-0.32764	-1.4389	1.7955	-0.61404
-2.13455	0.675751	-1.96341	-1.02628	-1.50131	-1.72708	-1.26788	-0.74585	-1.69342	-0.48456
-1.23633	1.40887	-0.44489	-3.08441	-0.33716	-2.02884	-0.68137	1.90796	-2.47659	-2.0834
0.469879	-0.16965	-0.65091	-0.64102	1.0463	-3.50726	-1.68765	1.28897	-3.49963	-1.03952
-1.93201	2.56808	1.09967	-1.38062	-0.90991	-3.15115	0.340851	1.17291	1.44528	9.40E-02
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2.49808	1.56839	-1.88623	6.09207	-9.79767	2.14252	4.65012	-0.83658	3.17117	1.12286
4.02637	-5.32648	-7.50745	-7.8165	-3.50519	5.56006	-1.82938	0.700531	-3.43497	-5.43619
-2.53568	-1.48041	-1.81787	-0.91272	-4.96158	0.277008	-3.95526	1.67346	-1.63959	-3.5524
-1.20987	0.465118	1.3154	0.963593	-0.25818	0.465668	-1.74158	0.414703	-1.73096	-1.32974
0.415192	0.880798	-0.73953	-2.08545	-2.04956	-0.97134	-0.4162	-1.03787	-1.89417	-0.31909

-6.15E-02	-0.54016	-1.37646	-2.64847	0.352814	-1.47766	-2.73212	-0.41028	-0.63953	-2.95963
-1.53922	0.768341	-1.32797	-4.34091	0.130554	-0.32523	5.79E-02	1.2045	2.29E-03	-2.17496
-1.02576	-0.24667	1.45917	-1.37988	1.29639	1.07242	-2.50E-03	-1.23755	-1.50671	-2.85938
-3.36154	-2.89752	-1.4595	-1.1199	-0.31036	0.147858	0.228424	-2.00684	-0.13852	-0.5173
-3.03E-02	-1.46497	-4.37961	1.48538	1.66101	-0.10336	-1.33527	-1.76141	-0.89893	-2.15732
-2.06171	9.91E-02	-0.19443	1.3223	0.116913	-9.59E-02	0.760864	-0.21429	-1.73251	-4.27838
-3.99896	0.204742	-3.46078	-3.25916	2.57114	-2.77283	-4.67758	-1.34341	1.45029	3.33954
-7.44473	-3.36609	0.403168	-1.25061	0.732819	4.20953	-6.715	-2.65869	-4.03882	-0.70096
-3.79605	-8.86246	-5.25323	-4.17749	-0.9808	7.21097	2.35834	0.269928	-4.47906	1.96512
1.2543	-1.83231	-4.64099	0.762695	-0.56796	-2.2804	-1.18445	-0.53754	-2.00677	0.695709
1.21213	-1.97E-02	-3.87601	-1.21973	-0.33658	-1.27682	3.73862	0.431519	-1.81165	1.39346
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-0.41556	1.23953	-0.25604	1.53003	-1.47629	-1.75848	-0.8353	1.26422	-1.74121	-0.72672
-1.34692	-0.12598	0.321106	-2.3353	-0.68344	-1.20282	1.22E-02	0.334106	1.07159	-0.83456
-0.83075	-0.49616	0.677765	-2.02457	1.26309	-1.64929	1.96719	1.41876	-1.9119	-0.30557
-0.32935	-0.57651	0.143188	1.1651	-0.17127	-0.35306	-2.01587	0.219757	0.872009	-1.78049
0.656464	2.24445	-1.19012	-2.76392	-0.1178	-0.57556	-2.88718	0.760468	0.167786	-1.37341
-4.35E-02	0.283386	-9.30E-02	0.91391	-0.1561	-1.75183	-3.37646	0.157104	1.29437	-0.6272
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7.29987	-3.07291	2.95877	-4.384	3.29593	-8.24107	-2.05701	1.81781	2.07617	-0.23944
2.47595	-4.32587	2.22256	0.975098	-6.34598	-3.12634	-4.16458	6.94E-02	-1.82837	0.720032
1.67783	0.670593	2.00043	-0.82761	-2.62378	-3.55048	1.04034	2.40137	-0.68018	0.464325
1.16861	0.117126	1.849	-0.30142	-1.15958	-0.87445	-1.92676	-1.44849	2.00726	-2.25653
0.226074	2.66531	-0.28372	1.05273	-1.06305	-2.78574	-1.26401	1.05463	-0.19568	-1.85461
-2.34708	-0.64996	-6.34E-02	-1.59058	-2.1824	-0.86649	-1.02069	-0.25388	1.0246	-0.83221
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1.99634	1.25644	-0.50949	-0.40564	-0.80917	0.524597	-1.72809	2.06711	3.9483	-1.47064
0.88858	0.135986	-2.20303	2.02979	-5.68698	-2.56497	1.80832	4.3222	6.23578	-3.95084
1.26614	2.32974	-3.68353	1.96909	-9.86389	0.89505	-1.87228	1.96991	4.73724	1.00241
0.906006	-6.94E-02	1.44882	-3.13651	-5.72607	2.45453	-2.09167	2.61945	0.824829	3.7355
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-1.12991	1.61102	-1.33762	-0.88425	-2.82025	-2.71432	-0.54129	-7.90E-02	-1.43799	1.20529
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-1.99573	-1.01215	0.446167	-3.24582	-0.71771	0.919159	-1.52936	1.52258	-1.36942	1.57578
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2.52603	-0.15167	7.33E-02	-2.34976	1.89624	-7.15881	-1.07809	-0.46631	2.51389	2.21823
4.13458	-1.48489	-3.45566	-2.35883	-3.62787	0.48703	1.3746	-5.9368	1.34497	0.819946
1.31375	-1.06107	-4.90024	-1.95581	-4.58179	2.30478	0.645325	3.74481	-1.03998	-3.44708
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0.784332	-4.36496	0.203705	-0.22644	-2.07877	-4.47501	-0.8642	2.4281	3.48251	-1.92795
3.50638	-4.728	-0.94486	0.580292	1.75644	-4.82709	-4.23E-02	5.62201	1.32907	-4.74545
1.96054	-5.93997	-0.34143	-3.29861	-0.25879	-4.28564	-5.49588	6.43903	-0.52786	-4.83887
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1.34674	0.943359	0.952637	-1.8949	-0.79239	-0.43277	-2.64459	0.892822	0.168488	-1.53522
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0.57489	-2.30396	0.401276	-3.10251	-0.38321	-2.47714	2.13702	2.48956	0.340576	0.351593
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3.79672	2.34894	-3.87619	0.108643	1.16815	1.77219	-3.22809	7.64E-02	2.0524	-1.43555
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1.6582	0.186279	-5.23328	-2.61642	-1.80798	-3.47009	-3.93115	2.84897	0.86203	4.3511
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0.397766	2.0394	0.866364	-6.4313	1.36783	-1.06198	-2.81949	-2.0885	-2.95773	0.371063
5.28E-02	-1.41107	1.91565	-0.16849	-5.17218	-0.18744	1.01471	-2.28378	3.75134	0.752533
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0.921356	2.48389	1.88095	-5.21442	1.55E-02	3.94653	1.03281	-3.22208	1.63239	-3.36606
0.660767	2.57373	0.676544	-1.29822	5.8367	-1.53345	-5.00177	-0.74887	-4.47946	0.411713
-2.89618	1.73648	-1.07907	-2.25372	1.68442	2.15042	0.427124	-2.87845	-2.79468	0.936523
-0.91647	2.59811	-0.1394	2.21957	0.815125	0.313751	0.153442	0.84491	0.748749	1.58456
0.273804	2.18811	-0.72882	-3.09006	-1.37204	2.76636	-1.4736	1.53442	-1.98E-02	-0.74179
-3.07916	1.78085	-1.28244	-1.97458	2.17651	1.16202	0.923096	0.850739	-2.4884	0.999695
-1.7001	1.67352	1.24741	-0.36099	0.156067	-0.20822	1.81107	-0.3223	-1.061	-1.80505
-4.17575	1.15604	1.33749	-0.71237	3.47E-02	0.235504	0.713501	-0.96283	-1.00192	-2.42007
-1.38004	3.81E-02	0.188812	-0.7851	-1.93567	-2.36053	-1.57047	-0.67242	-1.78851	-1.52948
-1.66351	-1.30695	-0.14502	2.55319	-2.13049	-0.42035	-0.54965	0.169373	-1.28271	-0.22492
-1.66641	-2.49472	0.975769	-0.75119	1.85638	-6.54184	0.463043	-1.77E-02	0.276672	-1.93118
-4.86346	2.10455	-2.78E-02	-5.10696	-1.15887	-0.69733	1.15469	1.2572	2.4552	-7.63934
-4.47632	1.28909	-3.49893	-3.89963	-4.07938	-0.60809	-1.7049	-3.8562	-0.26102	-1.94516
-4.58093	-2.33337	-6.24405	-2.87839	0.410797	-2.47293	-1.21078	-4.33069	5.51514	-1.77E-02
-1.4343	-2.37943	-5.01419	-1.65622	0.784241	-3.03439	-1.98187	-3.46725	5.32321	0.228119
-0.40027	-0.88687	-4.431	-0.18802	1.05124	-1.62125	2.14722	0.511993	-0.96976	-0.92682
-2.14E-04	-6.50E-02	-0.49634	-2.08066	0.407135	1.03348	-1.64749	-1.38779	-1.87958	-0.4426
-0.39288	-6.56E-02	-8.17E-02	-2.33408	-1.21469	1.22913	6.08E-02	-2.30725	-1.36423	-2.00021
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1.89E-02	-1.51611	-0.3678	-3.3288	-1.92575	-2.42743	0.351532	-0.78015	1.53461	-2.74649
-2.15591	-4.95596	1.24097	-1.70331	-0.30991	-1.52454	-0.11395	-0.73264	-1.99353	-2.84723
-4.4411	-0.49252	-6.18E-02	-5.44739	1.0271	1.64856	-1.12585	1.63062	2.98077	-2.3631
1.74353	1.12735	-3.02847	0.649536	-5.13855	1.74088	-2.3764	-1.1076	-2.13879	1.70703
1.21628	-0.6449	-6.92676	1.79709	-3.03058	-3.68097	-1.11618	-3.0473	-1.16724	1.85925
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0.700317	-1.22293	-0.68039	0.524567	-5.33026	-4.50308	0.316254	-6.48096	-3.39749	2.37012
0.543701	1.66461	0.305206	-1.83783	0.894318	-2.30814	-1.74557	-1.30688	-4.15E-03	2.40076
-7.56E-02	-0.24619	1.53088	-2.86526	-9.70E-02	-0.28983	-2.1066	-0.91168	1.54141	0.711914
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4.34921	1.29965	-0.19608	2.42065	2.10223	0.756897	-2.52139	-3.71881	-3.1561	2.64514
4.67538	-0.11169	2.91806	-5.94162	6.45853	1.02002	-2.90021	-4.52759	-0.45023	-3.80923
3.13156	0.105927	-1.04926	-4.94241	-2.884	-1.70224	-0.92429	-0.46198	-0.49905	-2.24509
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-3.82227	1.76675	-2.90286	-2.18387	-3.36978	-0.54556	-0.582	0.483948	-0.3941	-0.86112
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1.85294	1.51895	-0.54279	1.62064	1.73285	-3.98611	-2.53799	-4.78E-02	3.14029	1.16306
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1.3103	0.954773	-0.6207	1.73669	-2.20587	0.596924	0.351349	-0.44635	-2.09698	-0.2811
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4.93335	-2.76077	-1.55106	2.26999	-1.43869	-4.45624	-1.68777	1.20084	-0.25827	-0.68729
3.5632	-2.80991	-0.77008	-3.74362	-2.66406	-0.83868	-6.30365	-1.00275	4.86502	-5.7449
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-1.10822	-1.50449	-1.40433	-0.94836	-1.89127	1.84558	-0.63669	-2.14529	-3.04547	-2.34009
-1.52847	0.833649	-2.46E-02	-2.38339	-0.47018	-1.78027	-2.655	7.68E-02	0.575775	-1.66
-1.08292	1.63843	-0.46649	-1.42581	-1.80045	-1.26834	-0.88782	-0.4093	1.42371	-1.86826
-2.91473	1.42365	-0.42761	1.43802	-1.49442	-0.70688	1.01379	-0.68503	-1.0376	-3.65976
-1.40433	0.249786	-0.74481	-0.5144	-0.81686	-2.32394	-1.32288	-4.21555	0.166199	-3.75281
-2.02661	-0.24146	3.14359	-0.28922	0.978088	-0.50324	-4.50415	0.154175	0.487671	-0.98331
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-6.37238	-1.54391	-4.43158	-0.25501	-2.43246	2.09381	3.62744	1.48056	-1.86658	-1.0863
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0.886261	0.253784	-0.5509	-0.62772	-1.66235	-6.23914	-1.51108	-3.05814	-0.2543	-1.77869
1.40356	0.915649	0.793365	1.08548	-0.47769	0.729462	-0.85855	-5.65063	-0.40213	0.232483
0.640411	-1.03513	-3.44833	0.752594	-1.979	-1.08655	-0.77264	-6.6543	-0.12732	2.53439
-1.25558	4.79E-02	-1.78879	1.85184	-5.94046	-2.7092	-9.30E-02	-4.90692	5.47131	-2.98465
-0.69794	2.94571	-3.12503	4.68338	-3.48227	-3.80139	3.95581	-0.98419	4.20706	-1.93274
-1.72745	4.46103	-1.62885	4.67178	-6.23489	2.54758	-4.42007	0.871307	2.81143	1.93182
0.157227	0.38739	-1.77957	-1.40341	-4.03336	-1.31808	-6.62915	-3.63083	6.12122	-1.41238
0.172302	1.73541	-1.9928	-0.13892	-1.73257	-0.11563	-2.39987	-1.51169	0.597961	-3.70532
1.5285	2.60E-02	-2.58893	-1.26025	-1.43207	-2.32144	-0.59268	-1.01559	-0.95367	-0.21539
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0.930969	-3.10312	-1.44101	-1.1785	-5.24106	-4.27145	-0.71808	-1.89175	-1.18552	-3.30548
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2.28549	-0.44803	-1.90982	-0.4855	-2.22949	-0.46335	-1.51755	-1.28171	0.280487	-2.6264

1.15121	-1.04034	-0.9343	2.99005	-0.25757	-0.87482	-1.94839	2.53351	4.55319	-0.60284
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1.51816	2.20111	-1.40656	-1.80331	-2.35016	-0.62857	-6.55768	-1.00708	6.32318	2.23596
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2.62247	0.348633	-2.96014	-4.02551	1.88351	2.22305	-0.79257	-0.97659	-2.68936	-3.01349
1.60672	-4.07001	-2.0694	1.62018	-0.32867	-0.15347	-1.32077	0.921265	-2.51266	0.390106
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1.13123	3.44525	-2.87408	-4.34604	-7.40845	-2.79922	-0.69299	3.93179	1.3764	-1.39246
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0.204285	0.812317	0.583221	-0.44009	0.866241	-1.50604	-0.50662	1.12811	-1.3811	-2.48904
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0.727081	-1.1113	-2.52853	-6.51233	-5.81519	0.516235	3.99969	-1.30478	-1.58304	-2.14554
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-2.81461	0.972717	1.23431	-2.32E-02	-1.47815	0.617371	-1.99542	-0.1189	-0.15161	-0.91196
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-2.97543	0.4151	-2.27661	-1.11871	-1.10345	-0.50986	-2.48056	0.303772	0.406494	1.1554
-1.91873	-0.54025	0.437073	-0.91931	0.588501	0.982056	0.751648	-0.17783	-2.96732	1.20468
-3.0455	1.73978	0.615082	-1.91849	0.933197	-1.95444	-1.16635	1.03909	-0.3974	2.44751
-1.84167	-1.15347	-1.70688	-1.08664	2.07605	-0.19742	-2.81848	3.8244	3.08179	-0.73425
2.69806	-3.2995	0.259155	-2.13123	1.99823	-5.90799	0.201721	-1.15308	-1.26694	0.550659
4.01276	-1.31519	-1.48553	7.50861	1.0675	-2.87073	-3.39288	2.02191	4.37872	4.72452
-7.60648	2.45908	-2.19519	1.95728	-2.84958	-4.99979	-0.78537	3.63666	-1.52487	-2.59619
-2.5347	2.22083	-3.02191	-0.47272	0.118439	-2.98224	-1.43607	-0.9118	-3.42004	0.753082
-2.30051	-1.69958	-2.04413	-0.80167	-2.53604	-1.86774	0.142395	1.06113	-1.77338	-2.34119
-2.27307	0.748749	0.196533	5.01E-02	-0.396	-0.90207	1.04669	0.669922	-0.20682	-2.97183
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-3.146	-1.53113	-1.41522	-0.54642	-2.06091	0.19754	0.925659	0.569397	-2.15833	-3.0491
-0.73337	0.578033	-1.39139	-1.73035	-8.47726	-3.13742	-7.31171	-0.91382	1.4169	0.534149
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2.81506	-3.42996	-1.12643	-5.80292	-0.33838	-3.23712	0.982117	3.73932	1.21832	-2.58038
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2.5166	3.83432	3.0022	-0.44031	-1.52698	-3.25894	-1.21948	-0.67358	-0.73514	0.313263
2.44E-02	-3.69858	2.25516	-1.08096	-0.20166	-2.67303	-0.1247	-1.14587	1.60623	-3.46539
0.411743	0.189056	-3.19806	0.680115	-0.17889	-2.00946	-1.88019	-1.68695	-1.3222	-1.35522
0.338776	0.802643	0.71051	-0.79541	-0.68274	-2.56512	-2.64572	-1.46451	0.513489	-2.28195
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1.49033	-0.81223	-5.75958	-0.89362	-1.82816	3.84131	2.39075	0.891846	3.79123	2.797
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1.6282	-0.10352	0.903564	-2.55701	1.07471	-1.26825	-2.56036	-0.38211	-1.00201	-1.96078
2.66022	0.942139	1.33783	0.511749	0.533325	1.7215	-4.2149	-2.36551	-3.91422	-0.88846
0.833557	1.11319	-4.75995	-2.85971	5.72394	0.916107	-6.09308	1.95963	-0.81894	-7.58435
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1.09991	0.982117	0.352509	-1.09781	-3.67249	-0.71903	-0.80017	-1.1976	0.610046	-0.50864
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4.80283	2.01938	-3.78967	0.448669	-4.00296	-1.06897	-2.16537	1.93027	0.308136	0.359222
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0.107513	1.84296	-2.40207	1.23215	-1.09656	-2.05353	-1.24521	2.70261	-4.81769	3.11664
1.17838	1.03488	-4.57544	-1.65781	-7.73877	-8.16718	-3.2095	0.822205	-6.74011	-0.59036
0.823639	-7.09976	-5.98914	-4.0462	-1.85059	-4.40802	-3.26498	4.47772	-4.10565	3.07672
-3.45789	0.605591	-1.27789	-0.48892	-2.66516	-0.45578	-0.43137	1.23395	0.475525	-0.1647
-4.50177	1.42111	-4.17862	2.52859	1.10434	-2.19275	0.442139	-3.00989	0.472443	6.78E-02
-1.21371	-1.9592	-0.70242	2.94E-02	-0.37576	-1.91785	-1.0188	-1.73798	0.587311	-2.14291
1.59274	1.07074	-2.54276	1.0498	-5.09E-02	-2.44617	2.1116	-0.30676	-3.11722	-1.0285
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1.05304	0.655151	-1.49463	-3.37897	-1.43991	-1.55789	0.181305	-1.81943	-2.68591	-0.46018
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1.77866	-1.84799	-1.12173	-3.2012	-2.79807	2.58994	2.0116	-2.10748	-0.67514	-2.15256
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-3.53439	-1.93652	0.857025	-5.65802	-1.65698	-0.68018	-0.73438	-5.05804	1.13043	0.692505
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-0.39307	9.28E-02	-0.13055	-2.5376	-1.82449	-1.61816	-0.11002	-0.97247	-0.8497	-3.98E-02
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2.13E-02	1.46249	1.24429	-2.21652	-3.45596	-1.57034	-0.82358	-0.64352	4.37698	-1.08508
0.335968	3.49933	1.19098	-1.27582	-1.02029	-1.32916	-0.32257	-2.53802	-0.50983	-1.17111
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3.39276	-2.24228	-4.66583	4.4899	1.32001	0.899963	-3.79297	-1.73709	2.07724	4.59253
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7.62E-02	0.417847	-1.49207	-2.95398	-0.3252	-1.08966	-2.043	-1.12045	0.520782	-2.39072
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1.66476	-1.93277	-4.30911	-1.75717	0.635162	-0.77268	-1.5274	-2.43335	-0.9324	0.167847
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2.86923	-0.57877	-4.34109	-3.35916	-4.54947	-1.68973	3.4498	0.151184	0.157013	0.702942
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-0.72549	-2.40067	3.43021	1.9079	-1.38266	-1.44653	-1.10956	-1.1384	-1.27335	0.430084
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1.94833	2.44684	-0.42419	-0.34354	-2.79626	-2.40082	-0.21359	-3.53241	2.89511	1.83374
1.62808	-1.63281	-1.51825	1.39688	-3.72366	-3.41278	-1.15338	-7.33618	-3.34354	2.58435
4.12195	-0.87076	1.42145	1.0246	0.432098	-5.19025	-3.30518	1.79642	3.15543	-0.76157
1.19861	9.15E-02	3.34732	1.27148	-2.11148	-0.96869	-4.19897	-1.09225	-1.01678	-1.4765
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0.866547	-1.05103	-0.55701	-1.05511	-0.37155	1.57257	-2.92429	-0.49014	-0.58762	2.19092
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1.37341	2.41568	-3.00098	0.833496	-0.48386	-2.42947	-1.12527	-2.21326	-2.25119	-0.23218
0.59671	1.00601	-5.51901	-0.26102	-3.12006	-5.50095	-2.63998	-2.8577	0.350861	-1.96924
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-1.02588	-1.69171	1.1734	-0.73731	-1.28397	0.819733	-3.34677	2.02777	1.16382	-2.81927
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0.798492	-1.9371	-0.14703	1.01575	-0.96027	-0.67914	-2.79221	-0.32138	-1.63129	-0.59729
0.421326	-2.54285	0.590851	1.13422	-1.71329	0.828522	-2.60959	-0.40088	-0.92081	-1.65952
5.14E-02	-4.59378	-2.21027	-0.26511	-2.29245	-1.60324	-1.59521	-0.25519	-1.33389	0.803741
-1.26044	-3.59457	-1.34952	0.672821	-9.60E-02	-1.72449	-1.8465	0.112244	-2.2146	-2.69266
2.14627	3.84E-02	-1.83789	3.93E-02	1.69342	-1.22653	-2.90717	-1.08752	-0.7999	-3.57111
2.93466	1.79745	-2.18863	0.409302	-0.85681	-0.59085	-3.00818	0.34137	-1.06522	-1.78214
1.14539	0.281281	-1.91864	1.88901	-8.39E-02	-0.15204	1.70074	-0.2323	1.15457	-1.98581
-1.57117	-2.63824	-4.34778	-0.92264	1.67892	-2.44931	0.102417	-2.24692	3.0022	0.786255

-1.19E-02	-3.5401	-5.12125	-2.16412	-1.61829	-1.06427	4.5192	3.69751	-3.17923	-3.09125
2.95935	-2.21667	-3.31934	-2.82E-02	0.549408	-0.24674	-0.67468	-1.95908	3.64374	-4.20508
5.233	-2.27454	-5.24417	-1.32013	-5.91028	-5.75989	2.13315	-2.47354	0.358429	-1.23688
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1.19516	-4.29089	-2.34064	2.5524	2.72513	2.07092	0.892822	3.73572	-1.40582	-1.47894
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8.04E-02	-2.76654	0.166565	-1.52621	-0.22009	-2.62793	0.587952	-1.58319	2.55688	-1.76181
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-1.478	-4.84738	1.55377	-0.27466	-0.40466	-0.65753	-1.5545	-1.34698	-1.62659	-1.569
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-2.55112	-1.37228	-1.49628	-1.15521	-1.57996	-1.71814	-0.86932	-0.31339	0.12619	-0.59146
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-3.23404	-0.30771	-0.10059	1.68909	-2.26868	0.843048	1.09561	-0.98633	-0.43381	-0.65891
-1.36472	-0.29236	0.216492	1.22678	-1.07181	-0.33264	-3.03195	-0.41614	0.125885	-3.63013
-1.58582	-0.26733	-2.68915	0.266205	-0.94519	-2.43906	-2.45575	-0.22931	-3.68341	-0.84009
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-3.33789	-1.75299	0.771179	0.381683	1.14774	-4.10684	-1.86288	0.425201	2.19397	-2.60284
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0.269867	-4.95688	-3.44455	3.42429	2.8634	-0.69882	-2.44699	-2.75577	2.65903	1.44913
1.55212	1.92648	-4.47827	-2.48462	-0.69827	-3.46509	-2.71265	-1.18594	2.88751	3.10312
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1.27701	-1.37143	-1.15533	0.367004	0.818207	-2.82495	2.47974	-3.32001	0.365479	-1.51358
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0.690521	0.458588	-3.90118	4.78967	-0.16296	-3.27298	-3.30566	-6.60886	2.53131	3.8671
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2.14767	-0.57086	-1.02493	-2.0372	-0.87	2.53665	-0.12787	-0.14923	0.964172	2.36249
-1.36761	-2.97522	-1.22964	-3.67252	-1.19571	-1.32794	1.26556	-0.78061	-6.43503	0.494293
-1.84167	1.33875	-1.91428	-5.10165	-0.95245	-3.28992	0.541199	9.94E-02	-4.517	3.04596
1.31757	2.82858	-2.40393	2.75388	1.18094	0.859924	-1.18658	2.9487	1.32037	4.69745
3.45874	0.800629	-7.64874	0.370911	-3.62979	0.593567	3.88513	-2.35397	0.635132	1.9938
-0.69489	0.470673	-3.13397	2.01648	1.98914	0.272003	3.81982	1.28287	4.24402	4.22E-02
1.9324	-0.71549	-3.03772	1.8718	1.43372	-2.39523	0.599243	-0.22611	2.94885	-9.66E-02
2.0585	0.574005	0.351166	0.379639	-0.44046	-0.60202	-0.63638	0.172302	0.32901	-3.4155
-1.88257	0.466156	-3.33456	-1.16229	-1.62561	-1.71146	1.21011	0.14682	-1.7337	-1.72672
-1.89001	2.22473	-3.15179	-2.72922	-2.52954	-2.11111	-0.63333	0.518005	0.5112	-1.29565
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4.83694	-6.57968	4.46014	2.20319	-0.51389	-1.18292	2.91013	-0.10959	7.08E-02	-4.38107
1.38052	-3.95181	2.61591	-1.2438	0.983826	1.39743	-2.67078	-5.06696	-0.82297	-6.5545
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0.767517	-4.54166	-2.76294	-0.47107	-1.4537	0.301941	0.141388	-2.40155	-0.22202	-1.15073

0.272797	-0.57916	-0.59888	-1.55029	-0.19455	-0.99442	0.891357	-0.75198	-0.14929	-1.72217
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-1.39001	1.42853	1.78268	-1.37982	-2.15829	-2.49576	3.52322	1.64319	-1.31372	-1.21991
-0.6171	-0.68951	1.57706	1.76678	-0.39591	-4.31915	-0.41614	1.55179	-1.42581	-2.73041
4.07501	-2.67877	-0.13727	0.297638	-0.24725	0.678375	-0.5574	-0.6355	-2.44809	-3.70004
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0.308929	1.48224	7.97E-02	1.03204	1.19214	0.892395	2.07101	-4.18671	0.681793	-1.75327
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0.407654	2.88464	3.13306	1.98871	0.226898	1.90677	-0.81567	0.606934	2.51804	2.50122
5.134	0.10199	1.54422	2.30148	1.35422	1.77341	-0.78677	-3.09525	-6.34796	-4.59619
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1.82944	0.780731	0.280823	-0.52866	2.65613	-4.92853	-1.8895	1.4628	-2.40881	0.11853
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2.34634	0.253632	2.07657	3.55328	4.039	-7.71805	-5.62448	1.77301	-0.82037	-1.44388
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3.60406	-1.6387	-0.94833	-5.39383	-2.03339	-3.41989	3.6398	-3.78857	4.26846	1.54205
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1.44528	0.292542	-1.37158	-0.48709	-0.23746	0.109558	0.835175	1.00009	-0.9982	2.82416
8.84E-02	-2.10056	-0.97482	-1.19208	0.742493	0.979126	0.233521	2.92117	-0.57181	-1.08575
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0.728638	0.983734	-0.77228	-1.63895	-1.03366	-2.76093	0.789795	-1.42752	-1.67569	-1.01855
3.29987	0.347809	-4.11325	2.31888	-6.97336	-1.29807	-0.67239	-0.31339	-5.30902	-3.86176
0.177155	-4.30197	-4.27664	2.63239	-1.11398	2.01196	2.29044	-4.25989	-0.60336	0.386932
-0.2854	1.82138	-7.61728	3.20337	0.512817	-2.12619	1.92874	-0.87485	-0.37207	-0.84058
-2.03198	1.13153	-8.0419	2.74429	0.169922	4.38E-02	-0.13709	0.567108	0.704468	1.18378
-1.64392	9.27E-02	1.77728	-0.26086	0.694458	-0.90015	0.459991	-0.54279	-0.81287	-1.21732
0.706024	0.23465	-0.80154	-2.8252	-0.4838	-0.35736	-2.48682	-1.40677	1.26138	-0.90503
0.219177	-1.41028	-2.47098	-0.9061	-0.43524	4.66E-02	-0.86173	0.808197	0.641998	1.41254
-1.48315	-2.59787	-1.42963	-1.18329	-0.54092	-0.88528	-1.50751	-1.57013	1.10178	-0.50797
-0.69165	-1.4581	-1.78259	-1.51541	1.45352	7.28E-02	-1.28897	-2.46744	-0.18869	0.446594
-1.16922	-1.07315	-1.85733	0.559998	-3.0939	-2.08E-02	-0.29565	-1.57782	0.33667	-0.85791
1.03769	-2.01743	1.42438	1.9256	1.06628	-5.31284	-3.74435	2.54791	-0.57291	0.830597
1.46994	2.89145	2.7254	1.16064	-3.73856	-4.5896	-1.87589	-0.87351	-1.07251	-1.26276
4.59546	-0.8999	1.09915	-0.54483	-4.15167	-0.16409	-1.66809	-5.65329	1.09238	1.27176
0.372345	-1.17828	2.83545	-3.99881	-7.12729	-0.13654	4.67813	0.329529	3.58783	-0.53247
0.145203	2.58868	-0.54108	-2.3204	-3.85678	2.10931	4.34155	-2.82175	2.35571	0.711517
0.361115	-1.56506	-0.4827	0.79599	-1.47308	-0.83844	0.955627	-0.4596	3.72534	-1.11984
0.138702	-0.1648	0.165161	0.80835	-1.60605	-1.53253	1.87091	-1.68747	0.387634	0.473694
-1.62936	-1.24106	2.57974	-0.25729	-0.34201	-3.62E-02	0.524811	6.24E-02	-0.5285	0.766296
0.329285	-1.38348	0.234528	-2.6615	-9.92E-02	-0.53854	2.68298	-1.01709	-2.1492	1.91E-02
2.67755	-2.01266	1.60068	-1.01389	-0.74612	0.287109	3.90E-02	1.30777	0.776703	-1.16876
1.93347	-4.90E-02	0.125702	-0.62982	-0.67716	-0.22025	-1.81186	-0.88013	0.2901	-0.9324
-5.83E-02	0.401031	-0.93872	-1.05652	2.9061	0.59256	-2.65286	1.21997	2.78918	0.661591
0.786591	1.93506	-0.66025	0.801208	-0.28751	2.34726	-2.16684	1.2858	0.810394	0.727997
-3.19577	-0.87805	1.31201	1.22766	-2.81006	2.8743	-5.76028	1.18448	3.8327	3.84714
1.50897	-2.37592	0.210846	-3.8782	1.08124	-0.71918	0.275604	-6.8504	-2.27753	6.15784
2.09204	1.36111	-2.16846	-6.5929	3.48721	1.83386	-4.80487	0.713135	4.94403	0.658508
1.87253	2.47546	1.93033	-6.14362	2.42834	0.984619	-1.85938	1.78717	1.34662	1.05612

2.29642	1.10184	2.61841	0.252899	-1.02036	-1.21393	0.48114	-0.46201	0.858459	0.794678
0.747894	0.239014	6.20E-02	1.51865	1.39554	-0.46555	0.453491	0.334625	1.14352	-0.10629
-2.39877	-1.66455	0.851532	-0.3288	-0.13901	1.89E-02	0.180786	-2.65387	0.810394	0.587891
-1.21271	-0.58618	1.23392	1.40988	1.19366	-0.50632	3.07968	1.83E-02	1.21649	-0.79697
-1.15063	-0.12857	-0.91101	1.66092	4.19537	-0.7898	1.38922	-1.81845	0.691101	0.107239
-2.24603	-1.92941	1.44E-02	0.701294	1.52463	1.10046	3.23163	-2.91733	-2.08441	-2.7887
0.95108	2.31693	0.947784	1.1413	6.01E-02	-1.46146	3.47E-02	0.345764	-0.75952	-4.92712
3.88809	0.902374	3.34116	-1.40149	0.761902	0.282166	-1.17E-02	0.24939	-0.32861	0.180389
2.29483	1.69556	1.66513	3.70364	1.33923	1.4953	-1.4772	-5.75632	0.733002	-1.50024
-0.44504	1.14359	1.00735	-0.48102	-3.68729	-0.74658	-3.65329	2.13501	1.08926	0.757446
-0.87204	-1.34497	-3.53604	5.93979	-5.40887	7.94577	2.17603	4.70941	0.884521	-5.24997
2.1987	-1.64124	-2.10269	-0.5592	-1.76816	0.246826	0.208832	0.784546	1.42252	-3.77921
0.770721	-0.34067	-4.85031	1.31979	0.144318	0.155975	-1.17386	-0.22809	8.50E-02	-1.32281
-7.69E-02	1.2442	-1.62054	0.551239	-0.42935	0.358978	-1.0975	-0.54788	-0.60019	0.57489
-0.40158	-1.28275	7.45E-03	1.11041	-1.35638	0.545532	0.258087	1.69275	-0.6456	1.12079
1.29117	-1.17429	-1.13177	4.29E-02	0.948059	1.40E-02	1.15738	-1.00351	1.1196	1.78784
0.230865	0.859436	-1.18933	0.876038	0.778076	1.1062	1.29211	-1.55383	1.5712	1.80655
1.77817	-1.00732	-1.25839	0.703278	0.984924	0.939972	0.46344	-0.34763	-3.67E-02	2.66589
0.208679	0.730438	0.996674	-0.66211	-0.94519	-0.86676	0.382324	-1.72021	0.857483	-0.54343
9.53E-02	-2.34854	0.802765	-1.2399	1.85049	-3.64795	0.717255	-1.08218	1.12909	4.52472
6.60892	-2.14746	-0.74548	2.37534	1.32944	-1.96973	0.852509	2.63989	-0.20432	3.21436
-5.57492	-0.7359	-1.57175	-3.77942	-0.12497	-1.21677	-1.43448	0.69101	-4.08823	-3.59256
-0.24295	2.29031	-4.92316	1.99249	0.235718	-2.45044	1.40912	-2.25369	0.81073	-0.80527
0.2883	4.99838	2.6105	-1.39651	-0.57547	-2.59039	1.02554	2.25494	-3.26697	-0.78439
0.975616	-2.09888	-1.1886	-2.81161	0.567841	-0.25833	-1.08557	0.222595	-1.24515	-0.25324
1.0022	-0.89328	0.797058	0.377228	-1.47424	-9.05E-02	-0.42218	-0.76358	-0.76788	-0.83872
1.39993	2.44513	-0.30505	-0.57938	-0.22058	0.199615	0.182587	1.14154	0.301178	-1.81451
1.39737	0.533539	0.244324	-0.91821	-1.18585	1.09836	7.54E-02	-1.4707	1.44672	-0.81305
0.330139	2.22873	0.285583	-0.40369	1.55719	-2.07809	-4.91E-02	-1.32803	1.48199	-1.75165
-0.20703	0.292786	0.80481	-0.13342	0.747833	0.80835	-0.68927	-1.60123	-0.5109	-2.58969
-1.81644	-1.77695	-2.07263	-0.80502	0.343292	1.14114	-0.59387	-1.47092	-0.26733	-0.61731
-1.1788	-1.76584	-0.28842	-1.92291	0.555786	-0.17703	1.32285	-1.41229	1.7865	1.81592
4.15674	-2.35196	0.129425	1.61584	0.248932	0.759583	3.7197	-10.3256	-0.2854	2.76154
2.23517	0.842407	-2.70123	0.332672	4.54733	2.89053	0.758423	-1.52158	1.05307	-2.34314
2.78085	-1.58908	-0.26984	-2.54779	4.5863	-0.19275	1.83774	-4.19867	2.76794	-2.47937
-4.5766	-6.95E-02	2.08832	-7.13861	3.49783	3.68262	-5.47736	-0.19174	-4.15826	0.383911
-0.76419	-1.57187	-0.10461	-2.59293	1.56213	1.28937	-2.09378	-0.39179	-0.48315	0.723755
-1.9465	1.2359	1.43658	0.149139	-2.06937	1.02496	-1.7554	-1.82739	-0.33337	-0.97852
-0.12988	1.35364	0.741943	-1.297	1.5282	-0.15009	-0.23639	0.650421	-0.2052	0.912476
-0.74701	-1.09708	-0.46808	-0.84351	0.101562	-3.54E-03	-1.02533	0.284088	-1.6951	0.841644
-0.25324	0.929535	-0.43021	-2.86649	2.28369	-0.75009	-1.52829	-1.38135	-3.13892	0.166626
-0.17783	-0.55222	0.508698	-1.6954	0.84613	1.46E-02	-2.41068	-1.26715	0.78598	0.775696
2.64548	2.45844	-0.50751	-0.12561	2.49249	0.319855	0.115448	-1.47571	-1.19733	-0.99423
1.211	0.175781	0.479462	2.71741	2.39221	2.11325	1.64114	0.160492	-1.0755	0.834717
-5.22476	1.36295	1.06381	-4.22656	-0.28647	3.29327	0.755096	1.1268	-7.15179	-5.23566
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0.269043	0.978729	3.63156	-3.561	-4.64398	1.28046	3.71793	6.39633	-6.36285	-1.80389

1.9039	0.631378	2.96451	-3.9631	4.09E-02	2.80722	-4.07446	2.04575	0.669312	-2.8959
3.16391	-1.53397	3.3327	0.641174	-0.54279	0.528168	0.55603	2.47891	1.96027	-3.92813
0.579895	0.898804	3.12228	-0.65897	4.04E-02	1.26727	0.155212	3.31201	2.02472	-1.5769
1.50793	1.37424	0.15625	1.80472	1.63321	0.319733	-1.12189	1.84692	-1.54202	5.84E-02
1.4325	1.54962	1.76373	-1.08472	-0.95514	2.19397	8.82E-02	3.6185	0.714691	0.78595
1.59344	0.60733	4.00467	0.127014	0.621674	2.6698	0.582703	2.78696	1.82599	-1.77875
2.20465	1.48648	7.3573	2.1362	1.48422	2.47195	1.02274	0.745148	-0.14999	1.035
-0.66434	-0.99707	3.84058	-0.22821	-1.9881	0.893951	-1.30576	-2.41113	1.65558	-0.62534
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-4.56003	-1.3671	-2.24286	5.70367	2.97824	-2.47217	-2.42059	2.87601	0.17868	-0.69525
1.82706	1.29462	0.800751	6.84381	1.8313	-4.69513	-4.69366	4.89783	-0.59787	1.24551
1.83E-02	-0.33783	6.703	3.74039	0.987122	-0.49619	-4.17105	-0.74753	2.85352	1.57382
-2.3205	-0.35797	2.2269	1.49E-02	0.490021	1.85007	-0.85806	-5.40E-03	0.542969	-0.17514
0.439178	-2.71979	-0.18564	0.371826	-0.61624	-6.52E-02	-0.534	0.883209	0.909424	-1.0123
0.265717	-0.38104	1.73834	0.285004	-0.7767	-1.42816	0.19931	-2.16165	6.64E-02	-0.81543
-1.92932	0.330627	0.854431	-0.38382	1.23926	-0.52963	0.712677	-1.53668	-0.22101	-1.16565
-0.82544	0.901031	0.506378	1.55704	2.05988	-0.672	0.127411	-3.23535	5.03699	-1.49017
-1.30713	0.836884	-0.26929	2.4577	0.237946	-1.05795	1.41104	-3.00934	1.60721	-2.4989
-1.65683	2.95645	1.31647	-0.54242	-0.31369	2.63815	1.17914	-1.36142	1.90E-02	-2.47614
1.38589	-1.55722	0.967072	0.562683	2.9259	1.77676	-9.33E-02	1.3848	1.11249	-0.22269
4.35321	0.185333	-0.16397	-4.02505	2.36664	0.425598	-1.58319	-3.36072	-0.44312	0.446533
4.39676	3.50119	-1.82083	0.38678	0.858124	1.95172	-1.52921	2.64682	-2.66092	-1.61206
1.63956	-0.29837	-2.30646	-1.87329	0.50351	-1.66644	-4.90466	5.99271	-6.35745	0.161621
-1.5083	-3.36343	-2.73618	1.62347	2.92813	3.56622	-6.22775	2.52237	-4.36618	-0.11929
6.54E-02	-0.83167	0.121704	-0.1369	2.10703	0.561066	0.87442	-0.32581	-2.67075	-0.24182
2.0528	-1.246	1.58246	-1.16595	0.614838	1.18106	-0.25009	0.411804	1.54901	-0.31601
2.00424	-1.13394	0.741638	1.77512	1.76901	-0.57758	-0.76639	0.150635	2.79498	0.186371
0.445984	-0.34546	1.5191	0.747894	3.06665	-3.07E-02	1.12427	-1.5575	1.37592	-1.34705
1.42136	-0.50028	2.55127	-0.73688	2.50488	-0.57648	-0.90509	-0.76303	-0.52332	-0.87827
-2.40823	1.03558	1.19659	-2.0376	1.27405	-0.53876	0.339813	1.99966	1.93588	2.00909
0.208588	1.60544	2.29828	-0.87311	0.778992	1.30994	-2.78857	1.97797	1.66599	-2.38202
-1.66269	-0.16773	-1.50623	-0.35211	1.10519	-1.91434	7.99E-02	1.0824	1.78528	0.229095
0.628113	2.77405	1.95871	1.74646	1.56934	-1.686	1.02991	-0.28549	1.6965	-0.74625
0.178284	6.0274	2.61066	0.63559	2.01913	2.71652	-1.2384	6.41193	0.478882	3.51315
6.10376	5.66644	4.76E-03	4.70428	-2.3179	-2.75885	-3.14078	4.07352	-4.10056	8.07593
0.732422	2.31647	1.90192	-1.62393	0.746033	0.515106	2.63553	-1.31625	-3.33456	0.427704
0.302002	1.80853	-2.05661	-0.98492	-1.31268	0.294067	-1.08627	1.14331	1.07047	-0.83942
0.880798	-0.60999	-0.30914	-9.24E-02	1.09033	-0.28842	0.238403	0.661804	3.37552	0.726593
0.810028	-0.22064	0.204559	-2.8819	-4.29E-02	-1.16116	-0.15939	0.716431	1.23199	1.84509
4.18E-03	0.564636	1.05392	-2.02261	0.112946	0.584656	-1.45532	-0.67249	0.13681	-3.44E-02
-1.11456	1.68323	-0.37653	-0.13898	-0.72553	0.555511	1.05811	0.745544	-0.29312	2.12314
-1.87234	1.6669	0.358887	-1.32391	-0.23056	2.01904	0.949829	2.76285	3.25009	2.96249
0.533783	1.17245	0.533173	6.38E-02	1.42789	0.671143	-1.98367	0.511475	2.38986	-0.23822
-1.59961	-0.84653	1.80E-02	-2.15192	-1.47241	3.33487	1.69214	-0.8486	2.95569	0.398315
1.35861	0.841553	3.98892	-0.50046	3.44223	-1.9433	0.705902	2.96161	6.0546	2.73346
-0.97382	-0.6521	0.94046	8.01828	-0.71606	2.38541	-2.85181	3.97733	3.24799	1.14496

-1.00903	-1.54196	4.79724	3.15939	-2.27148	0.395874	-3.45526	4.54443	-1.04608	-2.02017
3.0224	-1.76242	2.97513	2.52927	1.35254	1.48611	5.71E-02	1.17975	-2.25937	0.24231
0.764923	-3.71667	-1.11511	1.04709	3.01154	1.00125	1.94354	2.24179	-3.62595	0.726379
-1.33472	-0.29309	0.794556	2.28503	-0.95627	0.749359	-2.62628	0.441925	1.93301	-1.02661
1.69934	-1.42935	1.60983	0.566132	0.133911	-0.22467	3.93E-02	-0.82367	0.154877	0.296967
0.213196	1.14542	2.10641	-1.35559	0.575867	-0.50714	-1.26614	-0.74561	-1.68619	-0.25266
-0.26056	1.29855	1.62219	-2.75168	2.11227	0.105408	-0.69299	0.110046	3.3139	-0.73367
-0.41104	-3.4368	0.90271	-0.52152	2.35593	0.967072	-0.98886	-2.00903	0.482208	1.922
-0.71854	0.69693	0.68689	-0.91953	-0.1778	0.316254	0.496124	-2.54913	-1.52353	0.711792
0.433105	0.110474	-4.56E-02	3.33661	1.47598	1.51065	2.27716	-0.41888	-1.15543	-1.30179
-0.68439	-1.66586	-1.56607	-1.86765	3.42035	0.913483	-0.64539	3.05798	-4.28659	-2.17337
3.35226	2.0882	-0.40634	-5.40182	4.04074	1.45441	1.65842	-0.3396	-3.26474	-2.66174
-4.84985	5.45483	2.81564	-1.03909	4.19373	-1.51562	1.33163	6.55643	0.953033	-7.91409
0.973999	3.16629	-3.16647	3.37067	6.88553	-5.87567	-0.12366	4.21097	2.46521	1.69122
-1.4939	1.71292	-1.36301	1.53058	2.64883	0.167267	1.01062	-1.33951	0.273468	0.83078
1.75879	2.19553	2.14926	-0.50806	0.74585	0.967957	-1.7059	-0.76218	-1.15738	-1.17139
2.16373	0.656036	0.397247	-2.88989	-1.21561	-1.06308	-2.27191	-4.06E-03	1.74E-02	2.01889
0.992096	2.54272	-0.33719	-0.54089	-0.28095	0.925171	0.192657	-0.38629	0.982605	2.63E-02
0.733459	4.15543	-1.63873	-0.95609	-0.13593	0.752808	0.321106	-0.67325	0.382782	-8.45E-03
0.431671	2.29099	2.4614	2.2681	1.16153	1.39786	-1.45126	-5.98E-02	-1.6311	1.8111
-0.66724	1.89914	0.971893	-1.50513	1.71008	1.21506	1.28424	-0.24423	2.70676	-0.71481
-1.24921	-0.49454	0.370453	1.62161	-1.92441	-0.51004	1.50034	0.689209	-1.5	-2.87939
-4.15018	0.121338	1.25702	1.35706	1.08975	-0.44843	1.20459	1.9585	2.22281	0.736938
-2.37723	0.640594	2.82816	3.49887	4.88684	-1.23959	-0.97278	2.229	-2.38254	1.89545
1.26074	-0.63736	5.93585	4.01389	3.1145	1.58447	-1.28119	5.36893	-2.54367	-6.35278
-1.00919	-0.92212	-2.1886	0.822693	3.78094	1.97363	2.21005	3.07285	2.93732	-6.49228
0.670929	2.47421	1.86649	-0.98041	4.83664	0.287354	3.63632	0.485504	-0.80603	1.37296
0.500885	0.43811	-5.12E-02	-2.77176	3.03894	-2.05673	-1.27438	-0.42288	3.10764	1.1933
0.154144	3.03433	-0.14584	-1.47308	2.0741	-1.21686	-7.62E-02	1.33673	0.186798	2.01068
-1.62073	-0.41766	0.795929	-1.57181	1.98767	-0.54202	0.357361	-0.1333	1.4895	1.98315
0.43045	1.97495	3.25827	-1.15707	0.563385	-0.2424	0.412201	-2.04593	0.789398	0.685944
4.16965	0.465485	2.72299	-1.49081	0.788422	0.980865	1.31952	-2.93265	2.7334	0.454193
0.125061	0.106842	0.545868	-3.29E-02	0.777985	-0.13535	1.11594	-1.44412	1.84616	-0.93793
0.856812	2.46658	1.26776	0.202911	1.60831	-2.73795	4.74E-02	2.49069	-1.53183	4.78641
-0.85059	1.00485	-2.23428	2.34534	4.46362	-5.62653	0.60379	3.05179	-3.08209	2.16995
-1.85052	1.6539	0.999268	-0.36731	1.56442	-2.25958	-0.31949	-0.15109	-3.66614	0.684845
0.899139	-1.42578	-2.38394	-0.85269	3.0108	-5.90195	-2.74759	-0.16077	-3.36176	0.75473
1.02032	-2.44693	3.03513	1.62927	1.22495	-2.94348	-0.78226	1.07367	1.10193	0.558899
1.93301	-2.57889	4.2359	-0.97043	2.49173	2.64355	-0.76166	0.829712	-1.82153	0.419769
1.90118	1.93741	-0.17273	-1.84647	2.22995	-0.35114	-0.1825	0.213715	1.76212	0.383789
2.01984	1.79364	1.12674	-0.22397	1.44321	0.15094	-0.98239	0.276642	1.10229	0.14447
1.17297	-0.57886	1.61792	-0.548	4.34995	0.773468	0.253662	-1.36621	0.972595	1.18134
1.64926	-0.98306	1.17E-02	-0.77487	2.36737	2.9183	1.13672	-0.53534	-0.38431	0.150635
-0.91245	1.43307	2.36209	0.279388	2.04672	-2.63144	1.54062	-2.36093	0.400391	0.269623
-2.31573	-1.21625	-1.54971	2.00427	4.22159	0.757843	1.01132	-0.53842	0.431458	0.651093
-3.81E-03	-0.16812	0.387268	-0.48862	0.400787	2.07635	0.109161	1.65881	2.68417	3.62851
-1.96286	-3.64685	-2.45859	-6.62506	0.90033	-2.6351	0.248413	2.64868	3.48138	1.93713

-0.74414	-7.74442	2.90247	0.178192	1.93704	3.51331	3.8653	2.0719	-0.60403	-3.64096
-4.70374	-2.75146	-1.97763	1.87698	-0.7168	-4.27502	-5.36E-02	1.89752	-1.82626	6.03E-02
-2.67899	0.96759	4.16382	1.93829	1.44272	-3.64148	2.89474	-0.33893	0.884827	-0.6842
0.317627	2.30453	-2.25101	-0.20132	-1.26236	0.253662	-1.36728	1.70642	0.639557	-2.79852
-0.33542	1.55341	-0.14984	-0.14606	1.52756	-1.49664	-5.23E-02	1.07132	0.158508	-0.38821
-1.12796	-0.45047	1.93353	-1.56168	1.9111	-0.18948	0.976593	1.08374	-0.86682	1.8512
-0.81003	0.681122	1.66373	-2.31689	1.68375	-0.56012	9.68E-02	-1.83E-04	0.582092	1.64343
0.312439	1.84805	1.88708	-1.24197	2.11249	-0.87698	0.428802	1.67435	1.13208	2.67923
0.370056	2.3653	1.66669	0.641296	-0.72067	1.33896	-0.88876	2.47235	-0.3443	0.8974
0.732086	-0.56946	2.71017	4.40588	-1.09E-02	1.24985	1.42734	1.30746	0.379883	4.04749
0.511902	1.26086	1.12167	0.367004	5.58569	0.84317	3.48984	0.340607	3.15549	2.47461
1.79861	0.337738	1.86673	0.128143	1.66302	4.16699	-8.80E-02	2.4563	4.84311	2.12366
-3.23624	0.564087	4.12115	-0.44711	2.53922	-1.16656	0.221008	0.691925	7.38947	0.111542
-1.84805	2.18173	2.90677	-1.6709	4.91592	-2.28763	1.56894	-4.35797	7.37753	6.2803
3.21411	1.55429	-0.40598	-4.72501	3.67712	2.27301	2.47784	-4.00424	1.87262	3.06982
0.142822	1.76913	2.22919	0.997986	-0.29987	-1.28622	-0.88467	-1.37469	-1.77396	1.68658
1.01868	-0.19959	0.224457	1.04944	2.43304	-1.39124	2.7298	3.17203	-0.65448	-1.35001
0.414825	-8.54E-04	1.45615	8.08E-02	2.80789	-0.65576	-0.22141	0.91333	1.23428	-0.54462
-0.41602	2.68314	2.16611	-1.91721	4.68567	0.153656	0.978882	1.6268	-1.25681	0.969055
2.79395	1.51935	0.395386	-1.44467	0.761871	-1.13E-02	0.437012	2.57245	-1.7373	0.54715
2.99576	-0.6127	-0.90869	1.91788	1.28815	1.65027	-1.42517	3.69406	-0.69562	-0.59689
2.60358	3.53714	-0.76831	1.63919	2.96609	-2.12225	-1.64557	1.77786	-2.06143	0.237091
-0.1983	1.52377	3.18826	2.86099	1.1691	3.16077	-0.69077	2.10611	-0.73132	0.221191
-1.17377	0.313751	-1.32907	5.38104	-3.71097	-1.14651	1.65732	3.64059	0.560394	-3.66064
-3.55832	2.198	-0.62793	-0.31952	0.588928	-0.51328	4.29471	4.18872	-4.54782	-4.61566
1.89716	0.720337	5.24155	-1.84171	-2.354	1.61948	2.85641	-2.10947	0.588928	1.66931
-0.14697	2.62427	0.8815	0.13269	3.81952	-0.25479	-0.50525	2.35797	-0.15488	3.91992
4.69052	1.67322	1.76349	2.75439	3.07773	1.13297	0.925537	0.634003	1.64984	-0.66702
0.515381	0.358612	1.11908	2.23215	2.10083	1.25E-02	-0.32919	-3.14E-02	1.12851	2.84219
0.494324	1.01526	1.06754	-0.86899	-0.4823	-0.12906	0.466187	0.74292	1.8656	0.947174
0.58728	0.17334	2.56223	0.854492	-1.26456	1.39087	-5.55E-02	-0.45538	1.34192	0.334961
1.87506	1.04233	0.859985	-0.97247	0.247864	1.92551	0.103302	-8.69E-02	1.51279	0.130829
-1.74045	0.405701	2.05649	1.26147	1.49155	-0.16635	-0.63309	3.60446	2.65408	0.790619
-0.40292	-2.27377	-0.10941	2.3931	-0.9303	-1.22034	1.58524	2.77988	-1.01273	3.06259
2.53531	-1.78613	0.22467	0.442993	1.29199	1.79935	-2.53394	1.43521	0.683075	0.786804
-5.35E-02	1.23096	3.4494	0.840149	4.45193	3.12488	-0.2868	0.644989	3.04291	3.09564
1.42978	0.889984	4.82614	-5.46222	1.92392	-1.43768	3.02E-02	0.81311	-2.68744	1.43515
-0.64496	6.27164	7.06195	2.535	3.54422	5.74597	5.65863	-1.87619	2.70004	3.72092
3.66953	2.96317	4.5032	-0.55481	0.886841	0.521118	2.05243	0.995667	4.45264	0.871216
2.08731	1.79181	2.28128	1.70407	6.45E-02	0.804871	2.02124	-0.60449	2.26767	2.78848
-0.14981	-0.30869	0.205383	1.70505	-0.28415	0.539978	-8.78E-02	1.29382	-0.32178	6.47E-02
-1.59497	0.33783	0.829346	-0.58209	-0.71939	-1.20108	-1.76E-02	1.01022	3.40527	0.911987
0.201996	1.73813	3.66531	1.6011	0.440155	-2.83E-02	0.893768	0.987915	2.0762	0.629333
0.899841	1.77695	4.12039	6.40E-02	-2.29913	0.911804	1.53311	3.82446	0.146576	2.63455
1.86755	4.10718	1.37881	0.719879	-1.62738	1.08246	1.89154	2.46307	4.12201	3.36691
2.33109	0.71225	1.51599	5.56E-02	-2.5062	0.843964	0.395447	2.39929	3.61606	3.74197
-7.82E-02	-0.12482	1.17416	1.42679	-1.5419	-1.63724	2.34204	-0.25	6.54068	1.42E-02

1.42142	7.44E-02	2.36002	1.21036	1.48645	2.14349	2.91782	0.844696	-2.58569	1.93985
5.47897	1.13901	4.92157	2.12479	0.642242	3.34512	5.07401	1.56512	5.28717	-0.42835
0.216858	-2.35068	4.41727	0.233704	-1.25818	-1.66245	0.73761	1.95682	3.17734	4.37921
1.81631	3.23828	4.27621	-2.9501	-1.03537	5.56E-02	-2.88077	5.35306	6.00381	-1.38858
1.29572	1.33371	2.0047	1.3541	1.83044	-1.63754	-1.85968	-0.29779	2.32187	-2.19781
3.24759	0.577026	1.59106	1.80154	0.802155	-0.85684	2.63211	1.08932	0.488922	0.112396
1.90714	2.73035	0.336456	-0.33899	2.45361	1.71924	0.524506	1.34125	1.43127	1.39389
0.47879	0.476135	2.11401	-6.38E-02	0.340851	1.67758	-0.90244	2.173	2.5892	0.684052
1.68475	1.99353	3.07468	1.16663	1.44669	0.928101	0.454407	2.65646	4.77869	1.95914
1.79865	0.20639	1.5925	-0.32092	1.84683	2.30795	-1.67E-02	0.404449	5.0242	0.930695
-2.31064	2.76523	-0.19193	4.12167	0.742706	2.21915	0.779541	2.13858	2.83246	1.59778
2.8606	3.88806	2.75626	-5.82E-02	-0.1044	1.92136	-0.53326	-0.36289	2.11679	2.12592
0.309631	2.33325	0.678009	-1.90384	1.29922	6.04218	3.0285	1.43689	1.51099	-5.09854
-4.94E-02	2.71249	0.213867	-1.77142	-4.11539	1.93881	1.37289	-0.9556	3.80356	2.83575
-2.95294	-2.08307	3.47876	-2.8063	4.03952	-2.84534	-2.56638	-3.70999	-1.28787	-2.2692
6.08E-02	4.69757	-1.62308	-2.2355	4.98843	0.680511	1.03564	2.35565	-3.74527	1.66992
-0.44818	4.76584	3.62061	-4.47031	-2.20038	1.55807	2.90344	-3.64551	-6.52E-02	6.13266
-0.76672	2.47342	2.90887	0.150726	0.772736	1.12128	-0.95648	-9.64E-02	-1.47058	1.5928
1.25674	3.83093	1.85056	3.51413	-0.14758	0.209625	-0.39591	0.330048	-0.13843	0.901093
1.78818	3.06973	2.70071	4.63348	-0.13565	3.56E-02	-0.19022	2.73639	-0.99161	1.52774
1.31244	1.53833	1.13068	5.55313	-0.90424	-0.15848	-0.12738	2.32977	1.1438	2.11325
3.31885	2.69128	-0.2366	2.91049	-1.99957	1.86865	2.57092	1.92596	-7.19E-02	-0.84918
1.13757	0.930847	0.452484	1.90128	0.102295	2.86444	-0.30847	1.84848	-1.65884	1.33368
1.3548	1.52957	-1.10773	-0.27982	0.191711	1.92004	-0.21036	-0.1496	2.19479	-0.16998
-2.35437	1.74484	2.81693	-3.85486	0.592346	2.22888	-3.05371	1.9054	-6.00781	4.04294
2.42258	1.38541	3.35596	1.47958	7.52E-02	5.30792	1.9747	0.352997	6.90356	4.85785
3.07574	0.836731	-1.81613	0.48291	2.6955	-0.25104	-3.83588	-2.98349	1.52554	-0.22949
5.24802	1.18039	-0.94177	-3.57663	-1.15787	-1.77167	0.662445	-0.99475	1.78683	2.7049
1.99722	1.17743	3.24478	3.41867	0.510437	0.869171	-6.70E-02	1.36151	1.39236	1.41907
0.6586	3.51532	3.68167	2.34015	1.44916	0.465668	1.27002	0.19101	2.81003	0.116486
2.69263	3.52533	0.904449	5.05063	1.2692	1.71072	0.360809	-1.06476	1.06149	1.53729
3.56927	0.655426	1.51373	4.55679	-2.24344	1.68878	1.74387	-0.35089	0.901917	2.65915
0.216156	1.22604	1.94397	2.70853	1.39969	2.2991	-0.1564	0.758453	-0.6796	5.29303
-5.45E-02	2.4592	-1.37271	0.833679	9.34E-03	-0.90884	1.94733	0.461975	1.12698	1.38049
0.396667	2.38235	-9.24E-02	-1.08792	0.451294	1.50824	0.340942	0.500488	0.504486	0.555176
1.91769	-0.64694	1.17908	0.918213	-0.81039	1.01575	-0.52164	-9.45E-02	3.70999	-1.54028
-1.53519	1.64203	1.25201	2.75845	-0.28827	3.55179	2.45929	2.37158	5.04239	2.61905
2.88666	2.9028	-6.55203	2.5459	-0.43207	3.97623	-2.59259	-0.1597	6.67407	0.384766
2.61795	-2.44476	-4.40924	-5.74161	-6.70218	2.17728	2.43341	-1.87329	4.85913	-1.67078
-1.53458	-0.29733	-0.27368	1.58368	-3.76596	0.402313	1.48175	1.17825	3.90732	1.5329
-0.39429	0.92923	0.183197	-0.20331	-2.53967	-0.52103	0.111938	2.85739	1.59924	0.854858
2.84378	1.12302	-0.97263	-0.54205	-1.73065	1.73648	0.904114	-0.1872	1.22241	2.6795
2.16583	2.71194	0.346252	2.35712	1.3847	1.85733	3.70139	0.194031	4.55E-02	2.53287
1.37167	2.78482	1.28143	3.44861	0.521851	0.665375	3.73E-02	1.349	1.61331	0.178436
-0.30075	1.44604	2.95419	3.29764	-0.25342	-0.73129	1.03162	1.48615	2.9548	2.74185
1.52066	1.44989	-1.5459	2.14969	0.170135	-0.76675	1.65323	2.83466	1.46021	0.814117
2.54257	-1.83945	0.527679	3.13937	0.872498	-0.43475	1.46783	0.585785	1.67996	3.07019

-0.6698	3.23166	-9.74E-02	-1.3613	1.67371	1.14087	0.260254	-0.1835	2.57159	-0.5585
1.76672	-0.51297	2.05771	2.22964	2.97983	-1.07892	-0.3172	-0.62051	1.81519	8.58E-02
1.74438	1.58798	0.768158	-2.07062	1.93814	0.834808	-2.11499	-1.20398	3.74536	4.09366
0.592468	1.34232	0.510956	1.7247	-0.1695	2.35165	2.11972	7.33752	3.84134	1.12381
-0.78369	-2.41852	1.71011	8.88199	1.00192	2.57013	6.02643	-1.68524	1.31982	-0.55161
0.527924	1.39053	3.81158	0.898376	0.377228	2.46045	3.14053	0.300018	1.99796	1.66486
4.3923	3.28012	-0.14124	4.79605	0.804932	-0.99384	0.371307	0.736023	2.09732	4.67661
4.17282	1.83023	0.237335	3.4577	3.09799	0.508942	3.12439	-0.13937	2.1857	2.92087
4.60269	1.51453	-1.44427	5.51511	2.67807	0.397369	1.14948	-0.19391	1.63559	1.21826
4.38187	1.61465	-1.77451	3.97253	-0.69751	0.329712	2.47491	-0.83234	3.4668	2.61063
0.580963	-0.39032	-0.14911	-0.26581	-1.47015	-1.12424	1.36331	-0.94583	-1.0318	1.9549
2.19058	0.719055	-0.90512	1.06888	1.26379	-0.73776	3.60922	1.51868	0.397064	2.07877
1.5051	0.348785	0.755066	0.100311	1.68549	1.77576	2.85226	0.513	2.0029	1.43082
3.14581	-6.99E-02	2.186	1.97095	2.10745	3.08789	1.1673	2.6904	3.40161	-3.64536
1.61426	0.508911	1.45026	3.25418	1.48132	4.82581	-0.96478	2.88892	-1.43661	-1.06085
-2.47284	2.30453	-5.34525	-0.98901	5.34113	8.75076	-0.21878	0.461334	-5.26727	5.10443
-2.73358	3.53729	3.67212	0.720367	-1.43747	-3.508	1.81253	-0.80853	-2.03857	1.60922
1.77463	2.02551	3.28488	-0.20132	-0.89636	-1.07944	-0.13068	1.35339	-1.60004	0.525879
0.815094	1.27432	1.27438	2.48544	0.279938	-1.01083	-2.06281	1.17163	-8.32E-02	3.48849
0.874115	1.11865	1.87006	6.20001	1.879	0.410034	1.11911	3.00525	1.0654	1.13797
3.43179	1.47324	1.08502	4.6976	0.925446	-1.01193	2.88718	1.6297	-1.83438	0.823639
2.13187	-0.54965	1.54648	4.26181	1.68167	8.55E-02	8.48E-02	2.62216	-1.8378	6.31613
4.98267	0.498077	0.307892	2.75659	4.56723	-1.50293	2.63052	1.63495	0.218201	2.02679
1.12488	1.28293	1.46469	-1.0437	3.2468	-2.46756	1.47543	-0.16782	1.96896	1.62408
2.66159	1.23438	1.24188	2.2709	1.16739	1.34067	1.58334	3.41809	4.4151	6.02E-02
4.52362	-0.63486	2.1824	2.76636	4.35764	0.979187	3.01691	0.554504	4.60919	2.50565
0.832458	-1.87231	5.35657	6.3653	-0.24408	4.06592	-2.8157	-0.48618	2.69379	0.342255
-0.68094	4.76352	7.29086	-7.27441	4.31961	3.73328	4.79642	2.72211	2.23944	1.13763
2.4794	-2.46371	2.74942	-3.97791	3.93552	-1.51239	1.18655	3.35425	3.11954	3.7204
2.50772	2.38962	0.5401	0.827698	1.93713	1.49197	4.29782	2.1156	3.76956	4.09677
0.285278	-0.95419	-1.21484	1.08783	0.948456	1.40656	1.67709	-0.55548	1.01672	0.274902
0.571838	1.23895	0.687561	5.91373	0.704407	1.75623	1.3949	1.84903	0.812897	0.56427
1.02438	2.54163	0.970306	5.0517	2.39655	0.811859	0.592682	0.436005	-0.4307	0.883759
3.38635	-3.36E-03	2.41699	3.24924	2.40399	-0.47049	2.10901	1.42654	-0.64362	2.73483
2.38956	1.91769	-1.62119	2.74249	1.22653	1.40686	2.35522	3.11206	0.860901	5.24652
2.48868	0.898651	0.945068	2.65128	-0.46399	0.358765	1.25763	3.59897	2.30246	-4.64E-02
0.287201	2.66046	0.94278	1.74741	-7.70E-02	3.99387	2.29825	3.77771	-0.22501	2.30191
1.35492	1.65555	2.60922	-2.74176	0.870239	0.878296	3.4093	0.888	1.98071	1.55826
-0.97113	3.23709	2.94916	-0.3204	3.51404	-4.42389	2.83261	3.6011	4.50327	-1.69E-02
4.62396	4.06894	3.14737	0.128296	2.60291	-1.37823	3.64484	1.00302	-0.28546	-3.30499
1.93091	0.724182	3.34772	-2.19443	-0.73578	-1.98309	2.65234	6.06497	-2.76257	2.54141
0.261505	2.02231	0.366699	-1.07962	-2.71976	-1.29434	-1.12949	2.24442	1.34216	1.33578
1.40448	2.70282	2.61377	2.35333	1.66385	1.81207	2.29172	0.135406	-1.19379	0.243896
1.36264	1.21994	3.52563	3.37991	0.649994	1.03113	1.61261	8.64E-03	-0.46201	0.97937
1.23868	1.98944	3.64203	6.6424	1.53964	2.89636	3.21848	1.5112	2.76431	1.64813
2.98996	2.47455	4.02017	4.68433	0.616791	0.761505	2.7558	3.06937	1.5459	0.436432
5.07727	0.538788	6.75E-02	1.98349	-0.26907	2.59116	3.52252	0.442474	-2.66809	-0.54288

2.48538	0.517242	-0.86453	1.3385	3.32141	4.35486	1.35385	0.189178	0.556183	-0.88242
4.03339	2.89157	2.18127	-8.01E-02	-1.6803	1.74817	1.72095	1.86209	-2.4241	-0.25308
2.53851	3.19354	-2.54388	1.64786	-0.43488	2.54868	1.16852	1.1022	1.35889	-1.36346
-0.15253	4.51721	-1.14136	1.60797	-0.37286	6.97021	-1.66339	2.49481	3.22E-02	-4.85785
3.85165	6.14374	-0.77914	-5.9931	0.412811	1.95065	1.08633	5.71741	0.879639	-1.83847
3.9664	3.50146	0.905823	-5.436	-6.79376	2.61111	-0.38556	-1.55975	2.66803	5.12402
4.03632	2.18521	1.45718	1.1037	-1.12277	0.633362	-0.90228	1.3779	-0.56543	4.86597
-0.21011	0.78421	0.23996	0.437531	-0.24124	1.73267	1.50369	1.06302	-0.23038	0.127411
1.24664	3.96445	0.934235	2.59491	1.15939	1.39203	2.9649	0.435242	0.849091	-0.68863
-0.51971	2.32114	2.27051	2.68689	-0.69275	0.388275	3.89948	1.18201	0.883514	-0.73544
1.55066	2.43903	1.73898	3.12424	1.11758	2.51401	-0.12259	1.77637	1.91049	-1.78815
0.159546	2.29449	1.52139	0.900787	-0.67587	8.03E-02	0.956329	1.95435	3.26779	0.14502
1.04929	0.824951	1.79147	2.62308	-0.8161	-3.38095	1.91412	-0.96204	0.639771	-0.48084
2.98279	1.61508	3.35907	3.431	-4.73599	-0.76694	-0.40424	3.36389	-3.9205	1.07001
1.11523	4.64633	1.61151	2.81094	0.281342	-1.13342	1.33569	1.67319	6.77E-02	-1.82245
4.49728	1.25378	1.92E-02	6.5152	2.42032	-3.56989	0.967896	2.9913	6.14508	-4.09494
2.33176	-3.48898	6.62756	1.34561	2.1554	0.613159	-3.51569	0.829529	3.19095	2.37503
-1.25677	2.71548	5.62973	4.31598	-5.03E-02	3.09671	0.759827	2.74664	3.01584	0.262909
-1.06198	2.06943	3.9024	0.70108	-0.97907	0.529877	0.281433	4.74701	0.787445	-2.15494
-0.16193	-1.3013	-1.78903	-0.39935	-1.64325	0.148956	-1.7637	1.3092	0.523407	-2.02359
2.78802	-0.78546	1.13644	2.54453	0.463806	1.50394	-1.05609	1.18213	0.687897	0.517395
3.28967	1.88022	3.06583	3.20151	4.85E-02	5.36E-02	1.48706	1.31119	0.90509	0.955536
2.81116	3.01743	2.61307	4.07501	-2.12161	2.38611	1.26242	4.19965	0.237701	0.987549
5.50665	4.3609	0.958893	0.210876	-5.91E-02	0.289154	-0.18799	7.15515	1.7016	-0.89951
-0.77362	1.87875	0.666473	0.178497	-0.1304	5.62E-02	1.65735	1.22787	4.20068	3.24277
-3.39E-03	1.12436	0.305573	1.76239	1.75049	0.300446	-0.43955	-1.37421	4.564	0.254211
-2.32697	-0.21246	-4.6749	4.17615	1.29733	2.9751	2.55719	1.26828	6.86108	-2.18506
2.24838	6.8143	0.444641	6.11429	2.44E-02	-0.19489	3.80701	1.8685	3.86548	-1.08875
0.27536	-0.50287	2.08835	3.40479	-1.66599	-2.05875	0.938019	-2.79538	3.11862	0.955933
-0.3461	2.05328	0.516327	5.77527	2.52832	0.809814	0.631653	3.15665	4.83603	-2.63519
0.495514	3.73291	1.1138	0.5354	1.55304	-1.38095	-0.32138	-1.41501	-0.96744	-0.37643
1.04358	2.37332	2.98157	-1.12167	-0.75494	1.05026	1.5574	2.28192	2.53821	-1.5452
2.35233	5.18E-02	0.417938	1.22552	1.30569	1.24182	3.4549	1.97153	1.67499	-1.37332
0.566193	1.07782	0.896729	2.77219	9.23E-02	2.28616	0.871674	2.1853	4.20279	1.46594
1.58124	2.05795	3.64307	-5.91E-02	-1.43811	0.603119	1.29752	1.74786	1.81909	-1.45706
4.41336	1.65839	-0.40491	-0.70532	1.20602	3.24014	-0.82459	2.66257	1.92578	0.732208
1.53278	-1.13196	1.24179	1.0936	0.488983	2.04855	4.12195	3.27158	3.35568	-2.32803
2.37509	0.520264	0.800659	0.787384	1.58179	-0.47385	0.807953	2.35641	-2.81021	0.824707
7.71872	2.70764	-2.19839	1.48334	3.92944	-1.32382	1.49341	-3.93109	-0.86371	-2.99655
1.24728	0.341095	-0.30243	3.16269	1.98553	2.27032	1.6774	3.84662	-2.72E-03	-1.69986
3.13367	2.10913	-0.39813	1.91409	2.198	3.72586	4.47351	1.81573	1.90E-02	1.27753
0.916504	0.748779	-0.3826	-2.88693	1.61353	-1.25308	-1.26825	-1.55215	1.65921	-0.59079
-1.85287	1.35172	-1.81329	-0.90732	0.777832	1.15985	3.03534	-1.58411	-0.51856	0.41687
-0.38052	0.16861	0.216583	1.43985	-1.06204	0.693268	1.23392	2.52441	1.71204	-0.18289
0.542145	0.910553	1.43976	2.05023	0.221619	2.12332	4.3624	0.413635	1.53857	0.196686
-4.02E-02	3.15884	-1.43198	3.97589	1.89716	2.91586	2.37756	0.375488	2.05069	-1.64444
1.99036	0.897339	0.810974	5.73444	2.78128	1.58652	3.32062	-0.74173	1.73138	-0.93668

3.26517	1.6467	1.383	1.0658	0.834839	3.35745	1.64554	-7.68E-02	1.29739	-1.1116
5.14526	1.32773	1.69958	0.907074	9.37E-02	1.63416	0.255341	1.33328	-0.68933	0.154694
1.46851	2.69946	3.32266	-0.83429	1.34531	1.84006	1.62155	-1.8956	1.95239	-1.0466
3.36212	3.61716	-2.10519	-4.93E-02	-1.96216	1.71228	2.5376	2.09039	6.9653	2.26413
-0.64932	-2.51721	-2.96594	1.70468	-0.14478	3.99753	-0.9119	0.474213	3.74258	-2.52106
-3.17105	0.593231	2.85196	3.0527	5.74811	4.95438	5.41324	5.82632	3.18863	1.48941
-0.6232	-0.49204	-2.29349	2.99258	0.387543	-0.66968	-0.81607	3.68576	4.04962	8.02E-02
8.89E-02	1.43863	3.1684	3.4227	1.43552	1.30228	1.07751	1.47092	1.77277	1.80466
5.45108	2.60571	2.41296	3.51755	0.552246	1.22375	1.47751	3.63541	1.39041	0.243103
0.871216	1.92175	2.45013	4.79813	0.760315	1.16104	1.12799	2.29755	2.05798	0.824066
2.81268	-2.29828	1.54303	3.85651	0.539856	1.34998	1.74658	3.57611	2.63721	0.996948
3.20334	0.746643	1.09488	2.59732	1.31189	0.254822	0.960602	0.241058	1.19229	1.69235
3.13977	2.0791	1.9126	0.161896	1.93143	-0.39743	1.33643	0.831055	2.8183	2.84561
2.44168	0.739746	1.69498	1.5047	0.513702	-1.22705	1.22543	-0.95593	3.70587	1.20648
3.88791	0.285858	1.51477	0.612183	1.09369	0.446655	-2.15265	1.61969	2.32498	3.2287
2.98392	4.27563	3.48621	1.16644	-1.85037	-2.763	0.603607	0.648987	2.13751	5.15463
5.75446	-0.22949	1.65524	4.92407	1.00253	-5.36539	-3.58359	-0.23819	4.24149	0.612457
-0.71936	-4.67877	1.73535	6.29318	3.96231	3.04797	1.17374	4.83853	3.43573	-1.81647
5.98911	-0.34241	1.96252	-0.40881	-1.44006	5.59821	3.69205	2.93527	3.96252	4.5614
2.13232	-0.31598	3.1788	1.79849	-3.12228	2.12436	2.63043	2.15192	3.68375	1.20416
1.34769	2.94901	0.756866	-0.67026	0.533447	-0.55353	1.94382	0.779022	5.52603	-2.7543
1.48474	0.968658	7.31E-02	0.643127	1.93689	0.363831	0.498596	0.508423	3.90527	0.964569
2.87329	0.524414	1.07913	3.28281	0.305145	1.58917	1.75827	-2.21E-02	3.39169	2.19894
3.61664	1.62863	1.41708	3.50821	0.732666	2.43381	-0.92349	-0.33633	4.30609	1.20554
3.57385	0.729675	1.83109	3.08658	-0.22226	-1.08115	-1.59467	1.67667	3.79718	0.113922
2.47867	0.306244	5.42358	3.70169	-0.63461	0.60025	1.02173	3.18698	2.86328	2.85907
3.2348	3.39996	2.11728	-1.19699	2.67291	-0.94724	1.76755	0.124603	0.360596	1.74112
5.74704	4.88614	-0.81928	-2.68906	-1.83365	3.58109	1.7601	5.81061	0.51889	-2.80997
2.13367	5.77908	0.759644	5.15927	2.88083	1.41803	4.36862	4.2522	2.67456	-0.16284
1.67465	0.807434	-4.61343	-1.55429	1.8139	1.49005	-9.40E-02	2.39963	5.78293	1.93311
0.8367	-7.73E-02	1.42313	-2.07141	-3.27856	-0.27887	1.70374	-0.63574	7.42664	2.82E-02
2.42722	-0.10767	4.15228	-1.72223	-1.02148	0.954376	1.37933	1.4158	5.06345	0.212463
1.2619	1.10233	3.11548	1.32553	1.88614	0.744873	2.47079	-0.5853	2.55832	-0.71561
2.13354	1.36795	2.08496	0.410004	0.219391	2.38583	2.65891	2.24734	2.5806	-0.57651
1.84528	1.90314	1.81561	1.90689	2.46484	0.285675	2.25449	2.10281	4.42651	1.13736
2.48584	3.04825	-3.76172	1.67001	0.947083	-1.4509	2.32822	2.17856	2.8555	1.60004
3.65527	0.791595	-2.4472	2.2644	-1.33865	3.29587	1.96112	3.70526	1.23648	0.279907
0.664368	2.22534	4.65509	4.58E-03	1.17331	1.28574	5.39563	1.41656	2.88217	-0.47751
3.15649	2.18817	0.897675	2.4942	-0.63641	0.210052	3.21445	-0.22461	1.92279	1.4928
0.869324	3.09143	5.55E-02	2.37155	1.25455	3.93039	3.02942	1.93979	0.330902	2.26065
4.87216	0.57489	1.12994	2.28479	2.10953	2.61783	4.12662	-0.2601	9.27E-02	6.09256
2.23755	1.96414	-1.22363	1.7009	0.277496	-1.94693	1.33472	-3.40637	5.37622	3.13843
2.9501	-5.13681	-2.64429	3.33038	-1.33066	3.80991	0.925537	-6.25885	5.39581	5.02002
-1.69699	-0.66669	-0.68741	-0.72443	-1.70248	-0.55972	-0.12378	0.415894	2.15344	2.12457
0.68689	0.122498	-0.77524	2.06644	0.116333	-0.86972	-0.47141	0.576813	0.728516	1.50119
3.95752	2.81586	0.305542	0.820618	2.04871	2.90652	0.618408	0.431732	1.27658	-0.56281
3.54538	2.21014	2.49933	3.60388	-0.31305	3.82397	0.669983	6.55E-02	2.4173	0.482239

2.63284	2.33353	2.87646	3.20273	-1.21811	5.69101	2.91562	1.34344	3.25449	0.371246
2.75116	2.59158	2.9805	4.16818	-0.82315	0.921967	-1.81128	1.68176	1.14609	1.31601
3.47726	-2.33627	1.92789	1.60867	3.29089	3.11896	2.75253	-1.00974	-0.60043	0.949493
3.19611	1.49738	0.312164	0.591705	1.53839	2.01166	5.69894	2.69	-1.4682	1.85721
4.04874	4.05054	0.339813	5.44806	1.71893	0.822388	4.42831	3.7662	6.23541	2.18335
3.44507	5.88681	2.22336	4.13757	-1.47739	1.78302	1.1066	3.047	7.27518	2.94144
1.77036	3.29053	8.93475	4.35999	2.54382	1.25137	3.87982	6.08481	-3.06958	-0.54947
-1.71979	3.02069	5.62921	6.04938	0.926544	-0.97357	-2.75677	0.786865	3.66122	-3.57388
1.13272	3.08124	3.8349	2.32169	1.64471	0.165466	-2.09967	0.689819	5.13785	-0.57044
5.30798	0.785004	1.34418	2.59183	0.664246	0.633972	1.87082	2.26761	0.637421	-0.51639
2.95963	3.37973	1.10135	4.39911	0.447693	1.98154	-6.77E-02	1.88873	3.72638	0.864594
5.24689	1.85883	2.07602	3.3197	-0.81274	4.71747	1.64978	3.42419	5.37939	1.05286
3.42325	1.37424	2.81528	3.63101	-2.60962	3.1048	2.6265	1.19037	3.8493	0.198944
2.45425	0.233398	2.9664	1.16998	-2.28506	3.31445	0.204041	3.71475	3.6781	1.52692
3.90247	-0.26636	2.98917	0.447998	-0.53079	1.26474	-0.54236	-2.38931	3.38168	3.02829
-2.47189	1.69849	2.15308	2.80539	0.957794	1.69437	1.61166	1.5629	4.14359	-3.90948
-3.61526	2.60565	4.32971	4.72836	1.08035	3.93848	2.03659	1.01428	4.04639	2.25885
4.57828	3.98358	5.25156	9.75189	-0.18549	1.18143	5.00201	4.63412	2.79156	4.39566
4.59915	3.66562	3.62344	4.26721	0.434296	-6.79E-02	1.24261	3.85541	-3.49356	-6.44E-02
2.12662	6.08438	6.25452	2.17148	0.416534	-1.91199	4.07645	-0.69794	2.07874	2.3085
0.600525	5.73553	2.88269	1.5571	-0.80966	2.55325	1.44882	-1.06799	2.05264	2.67157
1.86728	4.207	2.61588	1.28854	-1.17627	1.89767	1.38922	5.88E-02	2.87213	3.0452
3.28122	3.41183	2.81546	2.10822	0.224213	0.178833	1.9827	0.645721	1.73059	-1.44E-02
1.95679	5.03442	2.92062	1.98468	0.166656	1.36447	2.34296	2.9346	-0.16699	1.25534
3.88605	4.89035	0.545288	4.26013	-0.87662	1.8009	4.84149	-0.17844	3.13879	1.27243
3.90137	2.22159	0.691589	2.04459	-0.29205	1.92526	1.72214	0.837555	1.47299	2.8342
3.10156	3.27203	1.71838	-1.48831	2.63779	2.97946	4.05304	1.60696	3.41217	2.02219
1.0423	0.519562	-1.64963	2.04651	1.98318	3.57547	0.351959	1.09631	3.93439	1.32101
-1.72757	2.28763	1.54773	1.13104	2.28125	1.45178	-2.46899	2.76648	0.64801	5.59665
3.51096	2.7514	0.833771	3.67758	-4.76956	1.76822	-2.43509	2.53	-1.92072	1.58444
3.03674	5.66132	4.72336	-2.32541	-1.22528	5.87607	-1.32556	1.62741	1.00455	-1.22647
0.674713	3.92917	2.87082	-2.78873	4.48004	3.3782	0.104126	4.73145	4.37952	-1.0661
2.37201	0.620728	-2.18091	0.127899	0.936615	0.124451	1.91483	1.255	1.51346	-1.06464
0.106293	-0.2153	3.62747	-4.28E-02	3.74524	1.88336	0.995697	1.0787	2.21262	1.83578
2.73172	3.16174	-1.20514	1.69611	0.683319	-0.88266	1.57211	1.72522	0.742279	-1.3334
2.79938	3.03561	-0.59827	1.36591	1.46576	-0.40744	5.65808	3.8934	0.945892	-1.90616
3.88586	2.23074	1.53937	5.25323	0.638977	-0.29749	2.26501	1.11206	0.46698	0.635742
1.91287	1.85599	-1.4736	2.1424	1.24753	0.328552	1.44873	0.714569	-1.21411	-1.9621
-0.23831	1.59894	3.37677	2.78409	-2.17032	3.32956	2.01614	0.917786	1.64166	1.68E-02
1.7048	-2.98071	2.37936	1.83481	0.453583	0.554443	1.35724	-1.755	1.3537	-0.20819
-2.99417	5.99E-02	-3.08398	1.38986	1.85794	0.9534	0.207306	2.92029	2.73209	5.44324
6.00757	3.9075	-1.68304	1.64938	-0.49728	-3.14859	1.18539	-4.9227	8.32419	2.48996
1.73605	2.76083	0.107147	0.162903	-2.603	0.61908	-0.94428	-4.29929	2.88754	2.75281
-2.14838	-0.31421	2.79071	1.21478	0.383118	2.88403	1.16873	-0.96643	-0.13678	6.1105
4.24942	0.391815	3.0433	2.25449	1.97412	1.43515	-0.48447	0.992493	-1.76096	2.50458
3.13388	3.185	-1.18204	-1.37955	-1.12576	1.86407	0.562805	1.41882	0.236511	1.43939
3.35272	4.35455	1.57324	1.70273	1.93271	3.34991	1.79419	2.37085	1.24759	2.72189

2.33978	3.66983	0.649017	2.11359	2.82135	2.57208	1.58057	4.16821	2.75812	1.32056
1.52255	2.76343	2.87469	2.25662	-2.00623	1.34671	2.6282	2.52847	3.16	1.91095
3.23096	1.63397	1.52E-02	1.9805	-0.30298	-5.08E-02	5.02542	4.29507	4.1929	2.823
1.48969	1.01465	-0.42722	1.85019	2.05508	1.18356	4.79623	3.26108	3.33618	2.44977
-1.15421	0.972687	3.61786	0.134583	2.06689	3.83887	3.26944	4.1803	1.35867	-0.39139
1.99622	1.11963	-0.88287	2.83905	-0.67816	1.62997	1.82611	2.3699	5.91281	4.44485
4.84937	-2.54691	1.63956	8.19308	-1.68057	-0.83548	0.36792	6.9938	-3.03522	2.83347
2.33984	3.80292	0.735962	7.20679	0.862305	-0.81665	3.55682	3.23602	-0.17716	0.270508
2.12271	1.78848	-2.58719	2.80148	-1.64557	0.228821	-1.32077	4.39005	1.32483	-0.9071
-0.3436	-0.28388	0.62439	0.887787	-0.63638	0.551971	-1.26257	0.916412	-0.58286	-1.03064
1.24258	3.11252	1.66608	0.782837	2.67773	0.110168	1.43759	1.93973	1.42374	-1.07159
1.13004	0.932739	3.09424	3.82913	2.2674	0.510742	2.6185	1.83334	0.583679	-0.47153
3.43958	-6.08E-02	1.03592	3.25479	1.77545	2.71188	2.57996	2.22769	0.132812	1.73315
4.26965	1.21213	1.55127	5.76062	2.72299	0.765625	1.70261	2.69485	0.686401	-1.09616
-1.83865	2.36819	1.10971	3.1311	4.20334	3.71786	-0.67856	2.54205	1.78659	0.764709
-0.74362	2.37793	3.65857	-0.21851	1.9827	-1.62674	0.351746	2.01328	3.54178	0.221375
1.75201	1.77618	0.358673	-0.16171	2.19919	1.93954	1.81494	1.87659	1.07288	1.64819
4.47614	2.36755	-0.79138	-1.98105	2.78015	6.9325	4.07071	3.93988	5.02841	1.45374
4.79538	4.4158	2.50964	2.54498	5.45004	6.75732	1.3071	5.0679	5.93466	4.30444
2.27716	5.37482	0.667969	5.84921	2.39062	-1.75293	-1.89096	7.51633	2.05722	4.39502
3.08902	0.435089	1.78E-02	-1.37512	1.26712	2.93393	3.76694	5.88165	2.07141	0.953918
2.22873	3.52203	3.84448	-3.59222	1.99652	1.83325	1.97943	-0.24851	4.39307	1.57156
2.98727	1.2215	3.06717	1.20865	2.09296	0.936981	0.479919	2.10922	2.95532	1.28311
1.54953	4.18063	1.28955	1.1658	1.23071	1.07544	3.22E-02	1.78464	0.258698	2.73618
3.1973	2.61304	2.45801	2.26471	-0.17645	0.151672	1.17697	1.1257	3.25549	0.752838
1.61417	2.81833	1.82407	3.95663	1.35919	1.8819	1.77982	2.96417	3.86349	2.79315
1.36246	0.182495	2.0863	2.27069	3.58664	3.65356	1.12503	3.50546	3.18008	-0.37351
-0.42844	0.723541	3.06729	1.93729	0.853607	3.78955	3.60425	-1.62201	0.952667	5.81E-02
1.80331	3.34366	3.13757	2.17081	-1.50671	1.42224	1.74704	2.04779	2.00589	-0.91721
2.87784	2.64655	2.311	3.18115	3.18433	1.03918	-1.82098	4.7388	7.58261	1.24466
1.98157	1.1373	2.56186	6.95389	2.68802	2.54373	1.79831	-0.6648	4.22247	4.36044
2.64874	-0.85797	3.18427	3.94919	5.57562	6.52505	-4.60059	-0.83679	-8.51E-02	1.75681
4.18442	0.498291	2.30072	2.7692	-0.24036	7.67361	2.68323	-0.51773	2.71112	-0.29559
2.72281	5.36801	0.725494	1.79279	-1.06448	6.09976	-0.85117	1.88492	2.90787	2.73346
4.25479	2.509	3.38467	1.32373	0.172241	3.43427	0.415802	-0.3523	1.47742	1.57501
3.95132	3.06573	3.27954	2.5426	1.3569	5.26294	0.470612	0.945526	2.87527	-0.28763
3.41147	3.35574	3.44312	4.83798	-0.48184	3.50778	1.09647	-0.21079	2.08429	2.45615
4.51114	3.38004	4.86237	3.91074	1.65088	4.198	0.781311	-0.26233	2.19897	-4.78E-02
1.63037	2.39407	2.98969	3.57529	1.27765	0.79657	2.87363	-2.91705	1.55429	0.899109
1.46347	-2.80356	2.19769	1.63419	1.03421	0.982544	2.57703	0.831085	1.96658	0.931885
3.9382	2.07059	2.27008	-2.27771	-0.16559	0.139954	3.19965	3.45889	2.0394	1.02811
5.29953	1.15115	-0.22589	1.47314	1.97192	-0.65701	2.95651	3.84308	4.53	5.16153
3.54846	2.95279	-1.13525	3.00699	0.976837	3.12393	0.987793	4.49051	3.44876	3.24966
5.79276	-0.68628	-0.35654	3.26221	3.03201	-2.21674	1.53021	0.951324	-1.76938	0.800232
-0.14368	3.35757	-1.18E-02	3.23438	0.217438	-2.61227	1.91275	-4.52325	6.82E-02	-5.61508
2.06583	4.56873	2.72809	0.561371	2.37454	2.21536	3.16904	-0.642	4.75784	4.05096
-7.26E-02	1.16162	5.22086	4.77563	1.83295	2.28796	0.217407	0.282501	1.89032	0.236206

1.51974	1.32544	2.04245	3.01251	1.99161	1.49704	0.65509	2.96664	4.28799	0.499573
2.59427	1.34833	0.985809	5.8215	1.77194	3.35477	2.32596	4.33789	0.815796	0.932037
3.35336	1.38535	2.96878	4.90063	1.69339	2.97421	2.97202	2.42337	2.69489	3.91302
2.48935	1.09729	2.42389	2.78848	2.10184	2.60745	4.44794	-0.79675	3.58179	1.9198
2.89926	4.12573	1.28098	4.32669	0.275391	2.70706	3.31113	3.46509	3.36206	2.03989
1.81628	-0.13062	0.720154	3.55371	-0.63379	4.42215	3.71036	1.33179	4.1362	1.60E-02
0.916718	1.87683	1.63171	-0.18326	-3.23355	6.93228	-0.90921	4.68719	4.24551	2.98715
2.83627	4.9548	3.98706	-0.8204	3.23022	0.701935	-2.7272	4.04932	3.38107	2.32086
6.52E-02	5.61053	0.468842	0.972992	0.633606	4.25537	2.99344	6.15482	1.29474	0.453705
2.07901	6.23459	-5.01007	-1.91373	3.42703	4.39471	1.04895	-0.58185	3.40302	1.98572
1.27933	5.49072	-1.29352	-0.41623	1.61423	3.05365	-0.84119	0.130707	-1.68805	3.66708
2.05399	4.14371	4.79926	1.13E-03	1.63266	2.72906	0.540009	0.121826	-0.57297	1.3963
0.869415	2.59375	0.625336	3.24423	1.17371	1.47781	1.26651	2.98853	-0.17822	5.29E-02
4.41379	4.69333	3.63	5.5097	-0.14673	2.71857	2.30219	3.35849	1.82462	1.24493
1.07697	4.10522	3.08237	4.42734	0.279266	2.67172	3.4931	4.34256	0.641479	-0.24335
1.99796	2.45547	3.1207	3.5051	-6.65E-02	1.06744	2.07861	2.40335	1.2106	-1.2309
3.48569	2.29453	1.64597	3.87918	0.967285	-1.51254	5.15E-02	2.91928	4.26526	-1.59592
3.96411	1.05606	0.822662	2.3356	0.331696	2.93387	1.52914	2.95071	0.23288	2.021
-2.03E-02	2.54724	0.788818	-2.33484	3.44012	4.06909	4.84921	3.11349	5.37631	-0.21857
4.70538	1.7142	5.13446	0.636597	-1.04608	3.20013	3.62741	-2.02118	6.13019	0.903961
7.37994	2.61032	5.30777	1.08218	0.20932	3.85867	5.16202	-3.29987	2.90164	4.09561
2.98062	6.41489	2.57251	-2.49533	-4.58E-04	-1.07919	1.29434	0.955963	4.77881	-4.64709
3.54831	1.94592	3.79678	3.15558	2.07733	3.72E-02	-0.63889	1.90482	3.15097	1.25946
2.90399	1.86682	2.26556	2.03235	3.15924	1.14886	2.62271	-0.52368	3.43851	1.61261
4.00174	1.63635	3.45425	1.31351	2.63339	1.32373	2.53751	0.927032	1.72598	-0.18851
1.96448	1.82034	3.02261	4.80258	0.206146	2.24466	3.67126	2.0802	0.807312	0.207153
1.39606	3.29993	1.55637	3.18024	1.41467	1.36771	2.0174	0.853668	1.4425	0.861328
5.08035	1.5022	1.63339	1.8223	2.03552	0.189545	3.28934	3.28156	0.811707	-0.1329
2.50568	2.15045	-1.32932	1.59619	0.973602	2.31396	1.59723	0.282379	2.36618	-1.03433
1.43829	2.68936	2.42026	4.01471	1.2222	2.62045	2.86365	0.915314	0.362976	-0.13348
3.27673	2.55594	2.63712	4.33054	1.68314	5.6716	6.68039	4.1098	3.83759	2.85016
5.10498	6.51511	4.10437	10.8127	-3.93817	2.01831	3.86801	1.91031	2.32376	-1.72784
0.689667	1.33844	4.34125	4.14569	-1.9765	2.63428	0.779236	1.45221	1.15173	1.29892
3.65842	4.31509	4.12943	2.37598	0.758118	1.33493	5.53983	0.827148	5.95844	3.11011
1.6282	4.46353	4.2243	3.87158	3.49884	-1.83932	2.92572	2.12109	1.95795	-1.39902
1.9455	3.15292	-7.69E-02	2.23264	2.02454	2.46027	2.8378	-0.1807	1.69043	-1.7337
3.13824	0.921936	1.61865	4.36081	2.12979	2.95764	1.8093	3.53604	1.23978	-0.95892
2.92847	5.62924	1.56583	5.65781	3.10715	1.82767	2.26926	4.42291	2.69891	0.272736
2.64566	2.94333	2.98987	4.68613	3.61618	1.5448	3.55911	4.59247	3.552	0.288635
1.78336	1.13849	1.73831	2.4541	0.829346	1.03986	3.52731	2.61865	0.244385	-2.93851
2.79016	1.95963	1.75729	0.832001	1.06219	3.22345	-5.75E-02	1.78809	1.67548	1.74509
1.69449	0.75647	2.09396	2.00931	2.61359	2.19E-02	1.13116	2.04681	1.784	2.13391
5.20044	2.05603	2.49982	3.96036	-1.45526	-4.10742	1.40131	6.6553	1.0636	3.02686
-1.79083	2.77859	4.17114	7.0246	2.90302	-1.80276	2.4202	4.57703	6.83527	4.72156
-0.84235	3.57532	4.12564	3.31601	1.4324	0.659058	2.59213	6.02982	5.52252	-0.83548
-0.802	1.10587	6.58353	1.40509	2.17334	-1.32477	1.42035	4.24255	0.862732	6.1189
3.65991	1.44763	1.5506	1.19308	1.18134	1.48645	3.33612	1.2832	-0.20764	5.13235

1.96799	1.56311	3.56207	2.79834	1.11563	1.37387	0.312714	1.73611	-0.29178	2.7381
4.77563	2.30075	4.48645	3.71933	2.51071	2.76144	2.06479	-0.60526	1.3201	1.32239
2.69327	2.84772	3.91962	5.23828	1.40186	1.49756	0.306061	2.52951	0.948303	0.894653
4.99374	6.42264	4.98239	4.31104	0.638489	1.8071	2.76752	2.24927	2.72208	2.05444
4.14706	5.02499	1.13641	2.37128	2.51614	4.94095	1.70563	1.40085	2.99741	-0.20389
1.66327	0.763031	3.23367	1.94827	2.2699	1.83746	4.82562	-1.05243	-0.25943	0.571167
3.25641	-0.92984	3.35345	1.75821	0.901611	4.16785	3.54556	2.2225	3.3147	1.38171
2.77951	-0.57565	4.28241	2.42575	2.66833	0.467194	4.1073	2.75E-02	0.961914	0.664856
3.60886	4.29901	4.99734	-2.7601	4.28741	-0.70477	7.19742	-0.33139	0.29718	-1.40985
4.24686	-2.88297	3.47025	2.34381	4.27612	0.580078	1.99771	7.19913	1.93954	1.99551
-6.82E-02	1.56708	5.22101	-1.88873	4.53992	-1.50748	2.38495	3.23346	0.757416	8.9704
1.07272	2.67722	1.0744	-0.18991	-0.24558	-1.70435	3.96902	0.2453	-0.83106	3.18698
1.25848	1.25452	2.45837	2.90515	0.768158	0.230255	3.26282	0.128113	1.72351	1.68149
1.34393	3.84674	4.41806	1.6723	2.08591	2.99173	2.0755	1.18182	0.435089	0.166595
2.86908	3.79434	3.81262	4.30469	3.00095	4.81488	5.07678	4.57E-02	2.43829	4.34705
4.04504	2.75244	1.20718	4.21252	1.80579	2.80142	3.35892	8.27E-03	2.98538	4.03104
6.29575	3.6301	2.0925	2.22888	3.92404	3.28867	2.60614	3.25967	2.57309	1.8009
3.75949	-1.64166	1.76907	3.1312	2.02859	4.26926	-0.93185	4.65479	0.375885	-0.50473
5.0983	8.84E-02	3.02496	3.13199	4.38269	0.66507	1.45126	0.789703	3.14359	3.00641
4.57242	3.96E-02	0.197327	2.81296	2.02893	5.12E-02	2.17819	3.19348	1.26208	5.28586
6.01318	2.52798	-0.21024	4.87027	3.10794	-1.46786	0.979309	2.85452	4.11337	1.90656
3.74225	3.84103	-0.14993	1.03171	5.5065	-1.82794	1.30814	4.31152	5.19684	-5.01E-02
1.77182	5.14279	2.4519	2.82578	3.64984	2.14551	3.20132	3.40054	5.90402	2.5744
0.54953	4.08032	4.457	2.1319	2.18024	2.43527	3.57324	1.85861	6.84286	0.425171
2.7724	-0.16208	1.02216	2.25964	2.23593	-0.86585	2.86349	2.14581	2.88513	-1.66641
3.70532	3.08426	0.713135	3.25113	2.33691	0.365234	1.12161	1.04422	2.05917	0.344788
4.09198	2.05612	1.82581	2.76151	3.75424	1.01456	2.21176	2.34521	1.32651	1.27826
1.91626	2.80243	3.79248	5.15512	0.899689	2.3956	1.65939	4.02505	1.32898	1.28174
1.52737	-0.45541	2.67371	0.577179	0.103424	0.244263	1.70282	3.69635	1.6199	3.05441
2.70099	-0.45267	-0.28033	5.14258	0.998688	0.516541	2.84314	2.42056	1.52368	2.29138
1.70459	2.97806	0.89447	4.11731	3.4306	4.34967	1.84824	2.04391	2.75348	0.69809
2.24142	1.52945	1.16562	4.08765	-1.31036	5.76538	3.99011	6.14288	7.22369	1.30585
3.86957	1.56628	1.74686	2.23438	1.87323	5.46051	5.7496	4.61942	4.77148	3.62585
2.40497	4.44342	1.13925	-2.86401	-4.66589	-1.78714	4.14331	6.54813	6.62415	3.35413
0.922516	5.02438	5.15421	3.89279	-0.36978	4.21851	2.55725	5.03635	3.68793	7.0224
5.42633	3.69101	3.27051	-0.90161	-0.41507	1.67258	2.82404	3.08041	3.01315	2.13306
1.72388	3.7149	2.16006	1.97183	0.371155	3.39706	0.892303	1.12372	0.64743	2.03641
1.86023	1.80975	1.04376	3.38623	0.741516	3.97714	3.65521	1.27405	1.28049	2.08078
3.16217	2.04724	2.26663	5.10699	0.575958	2.83817	1.55688	2.20569	0.225189	2.09436
6.87454	1.35245	5.73608	4.03574	1.29218	3.02863	3.8598	1.88885	2.87158	2.66565
3.12076	2.00739	3.38379	1.04959	0.575226	4.32547	1.17892	3.03525	2.60638	0.501404
2.50757	-0.39017	4.04758	1.25119	3.29089	3.49884	0.722443	0.687164	1.24417	1.61957
2.5419	4.35947	2.32376	1.6817	3.50571	2.59305	4.15225	2.50909	4.41937	1.18289
1.58682	3.66583	1.86111	4.12775	2.00925	5.914	4.13211	3.65131	4.92691	2.91916
1.08176	5.6629	3.33817	6.23038	1.55634	3.34033	2.4379	0.669525	2.68088	5.48114
5.03467	3.15582	5.70425	5.4155	-0.27399	1.99976	8.75601	-1.28049	0.130829	0.140533
4.59921	2.23407	-1.34598	1.57947	1.89243	4.10471	8.73624	1.32236	-1.29736	3.66132

1.97293	2.60141	0.777283	-0.20163	-0.44086	1.82236	1.89252	1.8866	-1.20813	3.51855
1.3566	0.79071	0.904572	0.920624	2.05585	2.09637	0.279297	3.5173	1.09772	3.98071
2.08704	3.20105	4.29935	2.19791	1.37909	1.82443	1.87961	4.12305	1.6597	3.27518
1.73639	4.03772	3.30942	1.70871	1.63455	1.41208	3.15408	4.44299	3.21521	3.98694
2.80576	2.82013	5.68939	2.62231	4.11807	1.1163	1.87332	1.75806	4.13229	3.15323
3.42795	2.28088	2.94299	1.61768	2.48782	-1.49765	1.46872	0.515656	-0.6004	1.62692
3.55988	1.73535	0.738464	2.16049	3.12338	0.323639	0.187225	3.12509	3.57718	3.78036
3.93729	1.98468	0.398682	1.69339	3.0542	5.49567	0.888336	4.5173	3.3172	2.72562
4.57642	2.85934	0.985504	-2.90976	5.03574	3.52017	-5.4772	5.151	4.93201	-1.67044
5.33948	5.37408	2.70276	3.25229	5.20383	1.58173	-1.25629	6.80252	6.43127	5.03094
12.0719	0.738922	5.60046	2.1507	4.25592	-1.28442	2.06473	6.17773	-1.52228	2.83731
2.62311	-1.61011	0.212219	4.40527	0.35614	1.84253	1.39145	-1.28314	4.78851	3.73392
4.3121	-0.31467	1.3183	0.6539	1.07333	3.82886	1.08212	0.596802	4.06625	0.547455
2.97678	1.33301	3.07697	1.08273	1.21243	1.16666	2.63501	2.00293	3.21982	1.5824
2.94193	2.91306	-4.94E-03	2.05063	2.0517	1.05563	1.63461	4.01654	3.03909	1.3671
3.23499	1.82352	1.17752	4.58798	1.87915	1.06436	2.81268	3.86679	0.679199	1.50305
4.02515	2.50345	1.42487	3.12912	3.39157	1.93591	2.64032	2.88596	0.713593	0.93045
2.45996	3.43887	0.609009	1.05609	3.48975	4.47095	2.45343	3.33417	0.765106	2.09579
4.24579	3.34875	1.54688	1.17657	2.96399	3.39874	1.40524	3.84268	3.17606	4.70679
3.1048	-0.45752	0.419952	1.54568	2.52618	2.23566	1.92194	-0.3717	2.14288	5.09351
2.84442	2.26926	1.82172	4.17014	3.69635	2.3689	4.1647	2.19159	0.940002	2.00574
4.54886	5.01721	4.04425	10.7778	2.94733	6.30972	6.35941	4.11331	4.68347	1.43396
6.10095	3.91992	6.41437	4.39719	6.97522	5.29196	-0.88117	1.22882	6.67383	2.41162
1.9404	3.95908	6.54602	0.128387	1.83932	2.9595	4.45505	-0.32816	3.34882	2.54971
-0.10129	1.36002	2.0766	-1.29791	0.476715	1.92056	3.30E-02	2.54691	3.55795	2.12656
1.59048	1.7507	5.16098	3.76144	1.72916	0.408752	1.0412	2.36472	3.08743	0.925598
3.87393	3.40863	2.72006	1.41083	3.22501	1.30634	2.57309	4.36743	3.96179	0.599182
3.9455	1.67682	3.54202	4.08798	1.99915	2.59897	3.90948	3.46881	3.35822	1.95074
4.39236	4.19815	3.90869	5.56223	1.03418	1.19891	4.09811	3.69556	2.98709	2.02304
4.93085	3.48618	0.531494	3.44009	1.03983	3.28885	3.42734	3.15866	4.6019	3.07672
5.30078	2.64444	2.00827	1.0152	1.71811	4.19275	-1.29846	3.45969	0.152679	1.01117
2.1243	-0.64832	3.39355	0.172211	3.29761	0.273865	1.62305	0.987915	6.48169	1.50882
1.19461	-6.56E-02	1.95441	2.34045	-1.76715	-1.32742	4.93271	6.47571	6.53809	2.64896
1.24637	4.73929	5.80536	5.5571	-2.33578	-0.36997	2.33621	6.2088	7.06488	4.67184
-2.28006	-0.39047	4.98944	8.3418	5.04062	5.17047	-3.25906	3.49283	2.34064	3.82373
3.51392	5.20929	6.44193	4.90619	-0.39896	2.34641	3.87292	1.05206	5.01984	4.97192
1.66791	1.83713	4.21118	1.2724	3.59662	3.55765	3.43793	2.48239	1.83636	2.26428
3.96979	1.57492	2.62115	2.73795	0.503235	2.59677	4.56509	3.20633	1.91452	-0.31519
5.22263	2.29416	1.96396	4.19922	3.6351	2.38712	2.62949	3.41785	1.63379	0.247681
3.60437	4.52914	2.56693	5.48151	3.36816	1.37708	3.87146	3.31921	0.839996	1.35333
3.99225	1.72354	0.254974	3.42914	1.78629	0.340302	3.53522	3.62167	2.48257	3.19095
3.35696	2.40198	1.25519	2.01718	0.711029	0.860443	4.39673	0.963562	2.52798	-0.2767
2.04639	3.05893	3.60947	2.19919	1.42E-02	0.186554	3.78152	1.89526	3.90646	2.51959
4.64331	1.86557	4.08987	4.13101	1.9126	2.62094	3.35056	2.31271	0.113495	1.9382
3.52841	2.86124	6.20453	1.25256	-0.10516	1.84628	4.46262	5.06268	4.55399	4.11426
0.108856	2.91089	5.53265	5.25598	-0.39017	2.26532	7.87781	4.35202	1.59317	2.93896
3.74414	7.21323	5.83096	4.49881	3.46231	-2.20273	1.80963	9.37253	5.80554	1.61121